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WALTER M. SOLOMON, M.D.
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HYDROTHERAPY FOR LOCAL INJURIES AND INFECTIONS *

FRED B. MOOR, M.D.

Professor of Pharmacology and Therapeutics,
College of Medical Evangelists

LOS ANGELES

The purposes to be accomplished in the treatment of local injuries and infections are (*a*) relief of pain; (*b*) prevention or correction of edema, ecchymosis and circulatory derangement; (*c*) stimulation of the local defense against infection and (*d*) rapid restoration of function. These results can be attained by the use of hydrotherapy, frequently assisted by other physical therapeutic procedures. Water is a versatile therapeutic agent and may be applied hot or cold, alternating hot and cold, by immersion, compresses, fomentations, sprays and douches. The effects produced are thermal and mechanical, the latter resulting from the impact of the water mass in frictions, sprays, douches and immersions on the bodily surface. The local effects of heat and cold have been carefully studied by a number of investigators.

Heat applied locally has been shown by Landis[1-2-3] to produce local capillary dilatation and an increase in capillary pressure. Accompanying these changes, there is a marked acceleration in the rate of blood flow, as shown by the work of Goldschmidt and Light.[4-5] The increased capillary pressure usually exceeds the osmotic pressure of the serum proteins, resulting in a positive pressure balance within the vessels. There is, therefore, increased loss of fluid from the blood stream to the tissues. Ordinarily there is also acceleration of lymph drainage, as shown by Drury and Jones,[6] so that edema is not usually produced, but with prolonged application of heat it may result. It is apparent, therefore, that the whole local circulatory process is greatly increased. Associated with these changes in the rate of circulation, there is increased leukocytic sticking and migration through vessel walls into the surrounding tissues.

Local application of cold, on the other hand, has been shown by Landis[1-2-3] to produce primary vasoconstriction with decreased capillary pressure lasting five to eight minutes. This is followed by moderate capillary dilatation which exceeds the preceding normal state. Coincidently there is a decreased rate of blood flow and decreased leukocytic sticking and migration. Cold, therefore, retards local physiologic processes. Local heat, on account of rapid dissipation by the increased circulation, does not penetrate deeply, but cold applications, on account of the vasoconstriction produced, abstract heat and lower tissue temperature to a considerable depth, as shown by Bierman and Friedlander.[7]

Alternating applications of hot and cold water, as for example in the contrast bath, are exceedingly effective in stimulating the local circulation. The processes mentioned are alternated in rapid succession. Considerable attention has been given to the proper length of immersion in the hot and in the cold water of the contrast bath. In a recent study, Woodmansey, Collins and Ernst[8] came to the conclusion that the best local circulatory

* Read at the Twentieth Annual Session of the American Congress of Physical Therapy, Washington, D. C., September 4, 1941.

reaction is produced by using a hot immersion of six minutes and a cold immersion of four minutes. Our experience, however, coincides more closely with that of Krusen,[9] who has found a five:two or four:one ratio to be most effective.

The local injuries for which hydrotherapy is of chief value are contusions, sprains, muscular strains and fractures. In the early treatment of contusions it is important to limit edema and extravasation of blood. Therefore, the treatment for the first twelve to twenty-four hours consists of immersion in cold water at 60 to 70 F. for thirty minutes every three or four hours with snug bandaging applied between treatments. At the end of this initial period contrast baths are started, and they may be followed by superficial stroking massage progressing to deep stroking. The purpose now is to hasten absorption of inflammatory products and to promote healing by circulatory stimulation. This treatment of contusions reduces pain, limits ecchymosis and swelling and hastens restoration of function.

The treatment of sprains is much like that of contusions. It is more important in sprains to retard extravasation and swelling than in most contusions. Separation of torn ligaments from points of attachment by quantities of blood and inflammatory exudate impedes the process of repair. Therefore the immediate immersion in cold water for thirty to forty-five minutes is essential. This should be followed by adhesive strapping, application of a bivalved plaster cast or snug bandaging. Adhesive strapping is not desirable if the hydrotherapy program is to be continuel. After the first twelve to twenty-four hours, during which the cold immersion is used for thirty minutes every three or four hours, the contrast bath, stroking massage and joint movement may be used once or twice daily and continued on through to complete recovery.

Together with muscular strains we shall also consider myositis and fibrositis, although they are not usually traumatic in origin. The treatment of these three conditions is similar, consisting of the application of heat followed by massage. It is desirable to produce muscular relaxation before the application of massage. Moist heat and infra-red radiation are usually the preferred forms of heat for this purpose. Moist heat may be in the form of fomentations, the immersion bath or the whirlpool or both. Except for the deeper muscles, it is my opinion that moist heat and infra-red radiation are superior to diathermy for muscular relaxation. After the application of heat for muscular strains and myositis, pétrissage is usually employed. For fibrositis and the more chronic forms of myositis, firm, deep circular friction is the massage movement of choice.

The use of hydrotherapy in the after-care of fractures is well established. The two baths employed most are the whirlpool bath and the contrast bath. Both produce satisfactory circulatory stimulation, but the whirlpool bath is superior for the relaxation of muscle, which is so highly desirable in the preparation for massage and for exercise. As soon as the surgeon indicates that physical therapy may be started, the extremity is placed in the whirlpool bath at 104 to 110 F. for fifteen to thirty minutes. This is followed by such massage and motion as is permissible with safety for the particular patient. Such a program lessens joint stiffness and muscular atrophy and hastens restoration of function.

Among the common local infections for which hydrotherapy is valuable are cellulitis with lymphangitis, acute infectious arthritis and acute bursitis. For convenience I shall also discuss in this group, chemical cellulitis.

The adequate treatment of a patient with acute infectious cellulitis with lymphangitis involves accurate diagnosis, with identification if possible of

the infecting organism, the indicated specific drug treatment, local rest and proper use of physical therapy. I believe that hydrotherapy ranks first among the physical measures in the treatment of such patients. For the average patient the program is as follows: (*a*) The contrast bath is ordered every three or four hours during the day, but if the condition is severe, both night and day. The part is immersed in the hot water at 110 to 115 F. for four minutes and in the cold water at 40 to 50 F. for one minute. These alternating immersions are continued for thirty minutes to one hour. In patients for whom immersion is not practical, as for instance on the trunk, the use of fomentations and ice are alternated. (*b*) Between the contrast treatments a large compress of saturated magnesium sulfate solution is applied, covered with oiled silk and lightly bandaged. The part is placed at absolute rest, a splint being used if necessary. No heat is required over this compress and is usually not used. With this program the disease process subsides rapidly, lymphangitis disappears, localization occurs and commonly no surgical procedure is indicated.

Case Reports

Acute Cellulitis With Lymphangitis. — E. W., a white man, 45 years of age, entered the hospital on May 10, 1941, complaining of pain in the right foot and leg, with redness and swelling of the foot. The condition had started as an itching spot on the foot during the previous week. The patient scratched it, and swelling and redness were first noticed two days before his admission to the hospital. Shortly thereafter red streaks were observed extending up the leg to the groin. On the evening of the previous day he was acutely ill with chills, fever and vomiting. When he entered the hospital the anterior half of the right foot was red, swollen and hot. Red streaks extended up the leg to the groin, where the inguinal glands were swollen and tender. The temperature was 99.4 F. and the pulse rate 80. The Wassermann test and the urinalysis both gave negative results: The white blood cells numbered 11,800 per cubic millimeter, with 82 per cent of polymorphonuclears. The patient was put to bed, and the contrast bath was given every three hours from 6 a. m. to 9 p. m. Between treatments a large compress of saturated magnesium sulfate solution was applied. A light, general diet and a large fluid intake were ordered. The patient was discharged a little less than three days later entirely recovered. No surgical treatment was necessary.

Chemical cellulitis from the injection of neoarsphenamine or other irritating substance outside a vein is treated along somewhat different lines than infectious cellulitis. Immediately after the accident occurs, the severe pain is best controlled by the ice pack, which also limits the severity of the local inflammatory reaction. Within a few hours, however, heat may be applied. In our clinic, we usually advise the hot immersion at home once or twice more during the day. Here again, between treatments the continuous use of a compress of the saturated solution of magnesium sulfate is applied. We have yet to see a slough occur under this management.

Chemical Cellulitis. — D. R., a white woman, 31 years of age, came to the physical therapy department on July 7, 1940, complaining of severe pain in the right arm caused by the accidental injection of mapharsen outside an antecubital vein a few minutes previously. Already the arm was considerably swollen. The pain was markedly relieved by the application of the ice pack for thirty minutes. Afterward the patient was given the contrast bath daily with the magnesium sulfate compress applied between treatments. She was advised to use hot immersion of the arm at home once each day. At the end of one week the condition was much improved and daily treatment was discontinued. One week later she was discharged practically well.

For convenience and brevity, I shall group the treatment of acute infectious arthritis and acute bursitis together. It is common practice to use heat in the treatment of each of these conditions. In fact, most of the orthopedic and physical therapy textbooks advise the use of heat. Heat is satis-

factory in acute arthritis, but in acute bursitis the already distended bursa is still further distended and the pain is increased. For several years I have used the ice pack as suggested by Abbott[10] in the treatment of acutely inflamed joints and bursae. The pack is simply prepared by folding finely cracked ice into a turkish towel. This is applied every three or four hours to the proper area over one or two layers of flannel and is left in place about thirty minutes. The ice pack is flexible and permits close apposition to the skin, which is not always easily accomplished with the ice bag. Local soreness and pain subside rapidly under this refrigeration treatment.

Acute Bursitis. — J. M. A., a white man, a carpenter, 39 years of age, was seen on Aug. 27, 1940, complaining of acute pain in the right shoulder. For two or three months he had had slight twinges in this region when bringing his arm down from above his head. On August 26 the pain became definite and sharp and he was unable to move his arm at all without severe suffering and was unable to sleep at night.

He was placed in the hospital, where examination revealed acute tenderness over the point of the right shoulder. Even slight abduction of the arm caused great discomfort. His temperature was 100.2 F., and his white cell count showed 11,400 cells, with 68 per cent of polymorphonuclears. The Wassermann test was negative and the urine showed nothing abnormal. The rest of the examination gave essentially negative results, and there were no apparent foci of infection.

The patient was confined to bed with the arm abducted as far as comfort would allow and supported in slight external rotation. The ice pack was applied to the shoulder for thirty minutes every three hours from 9 a. m. to 9 p. m. daily. No other treatment was used until the end of the sixth day, when contrast applications were begun. On the fifth day, however, he was able to execute a full range of shoulder movement with only slight discomfort. He was discharged on the ninth day and without medical consent worked at his trade on the tenth.

I have described the use of hydrotherapy in the treatment of a few common local injuries and infections. The list is by no means complete, but the principles of therapy have been illustrated. Local hydrotherapy seems simple, often too simple for either the patient or the doctor to accept. The results obtained, however, fully justify its use. It is a method of controlling local circulation, of relieving pain and soreness and of rapidly restoring function. It is useful both in local injuries and in infections.

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Discussion

Dr. Ralph S. Emerson (Hempstead, N. Y.): The author has given an excellent discussion of the physiology of hot and cold water in the light of present scientific knowledge. In the past many physicians have ridiculed the "decongestion" explanation physical therapeutists have offered to justify the results. Fortunately, it is possible now to explain the beneficial effect of hydrotherapy in terms of physiologic and biochemical changes in tissue fluids.

Dr. Moor has called attention to the penetrating effect of cold applications. Recently this property was utilized to amputate a leg under ice anesthesia. This method has been used frequently in poor risks at the City Hospital in New York with satisfactory results.

The use of hydrotherapy in the aftercare of fractures has been justly emphasized. Too frequently perfect alignment of calloused bone is observed with a nonfunctioning limb. Many of these tragedies could be eliminated by the judicious use of hydrotherapy. Some physicians will remark that measures of physical therapy are not required following immobilization, if the patient will continually do muscle exercises. This may be true, but the intelligence and cooperation of the patient are not one hundred per cent. The result is that many develop varying degrees of soft tissue complications when they do not receive the benefit of hydrotherapy.

The treatment of infections has been revolutionized by the sulfonamide drugs. The results have been miraculous. To the best of our knowledge these drugs possess the ability to interfere with the metabolism of bacteria in such a manner as to prevent their multiplication. They do not, however, directly influence the local tissue resistance. We can increase the latter by hydrotherapy. I hope we will not limit ourselves to pills in the treatment of infections but will attack the problem not only from the standpoint of destroying the invading organism but also by increasing the local tissue resistance of the patient by appropriate measures of physical therapy.

Dr. I. Levin (Washington, D. C.): I have enjoyed the paper presented by Dr. Moor. I am glad he gave us a review of the report made by various investigators of the effects of hot and cold on tissues. I feel it is valuable to know these facts. Hydrotherapy can be given to greater advantage and benefit if these facts are given consideration when it is prescribed.

I was interested to know about the results Dr. Moor had gotten with contrast applications in various local injuries and infections.

In my own experience, among other forms of hydrotherapy, I have had good results in various injuries especially with the form of whirlpool bath that utilizes mostly underwater air and water massage. With this type the temperature of the water can be regulated fairly accurately at all times as well as the pressure from the air injectors for heavy or gentle massage as desired. With the heat of the water and the pressure of the air under control, the patient receives the benefit of the desired relaxation from the heat at the same time as the automatic massage according to the needs of the condition being treated. In cases of contusions and sprains the effects are absorption of extravasated blood and other fluids to reduce swelling and reduce disability. For patients with strained lumbar muscles and sacroiliac disability, the effect is to relieve muscular spasm and give relief from pain. In my experience with postfracture cases the buoyancy and heat of the water in conjunction with the automatic massage greatly curtails the time of disability. It is also easier to manipulate the limb involved while it is in the water and immediately after removing it from the water than without such treatment. In peripheral nerve injuries with muscular paralysis or weakness the buoyancy of the water with the gentle massage seems to hasten recovery.

For patients with bursitis of the shoulder of long duration when there is limitation of motion, a large tank should be used with the same form of air and water massage as is used in the previously described injuries. When relaxation of the structures is obtained, then gentle manipulation of the shoulder can be carried out in the water. The same technic also seems to be as effective for patients with chronic arthritis of the shoulder. Patients, as a rule, like this treatment, do not object to it as they do to exercises and manipulation out of the water, and they get motion back in the joint quicker than by other methods.

There is one big handicap to the use of such equipment as yet and that is the great expense of such apparatus. Otherwise, I have found its use satisfactory.

Dr. C. O. Molander (Chicago): It is a pleasure to discuss Dr. Moor's paper. He is accomplishing a fine piece of work in Southern California. There are, however, a few points which I should like to emphasize with regard to the use of hydrotherapy in the treatment of local injuries and infections.

There are five ways in which heat may be applied: (1) dry heat, (2) moist heat, (3) long wave diathermy, (4) short wave diathermy by the electric field method, and (5) short wave diathermy by electromagnetic induction. The quality and quantity of radiations emitted from these sources depend not only on the physical properties of the source, but also on the input of the energy and the intensity of the heat generated in the radiating object.

It should be stressed that the kind of heat applied makes a difference from the standpoint of the patient's comfort, and the results to be obtained. Many ask, why is it not possible to obtain the same results using any of these five methods, and wherein lies the difference? Clinically, moist heat stimulates the arterial circulation in a powerful manner, producing a

rapid vasodilatation with considerable hyperemia and an increase in measured circumference of the limbs being treated of from one-half to one-third of an inch. There is a stimulation of the lymphatic circulation and the retrogression of inflammatory process is accelerated. There is a sedative effect relieving pain and muscular spasm, thereby making it easier to handle painful and sensitive limbs. The use of dry heat produces a more prolonged reaction while the use of moist heat is not so rapid and is not so prolonged. With the application of short wave diathermy the depth of penetration of the heat is greater so that for deep seated involvements one can in many instances produce better clinical results.

Furthermore, it must not be forgotten that there are various stages of treatment. For example, consider an acute sprain with much swelling. It is wise to apply cold applications immediately in order to control hemorrhage and to apply a Whitelocke compression bandage. This is the use of sheet wadding over which is applied a Tetra elastic bandage which is reapplied within a few hours while the limb is kept elevated. Within twenty-four hours dry heat and light stroking massage may be applied. As the swelling subsides, perhaps within forty-eight or seventy-two hours, moist heat, that is, the whirlpool bath, may be used. The reason for this is that we may produce at the onset too marked a vasodilatation and hemmorrhage which makes the use of dry heat better in the first stages of treatment. When edema has subsided the second stage begins when the use of moist heat is indicated. In the third stage the use of moist heat is continued for a longer period. Massage is deeper and graduated passive and active exercises are begun. I refer to acute cases. I would like to suggest that the report be read of Dr. Simon Benson, "Volume Changes in Organs Induced by Local Application of External Heat and Cold and by Diathermy," which was published in 1934. I feel that there is need for further careful experimental observation.

Dr. Disraeli Kobak (Chicago): The author is to be commended for his timely preoccupation with a therapeutic measure that more than any other procedure has been extolled by ancient and modern students as a sovereign remedy. His objective evaluation of the therapeutic effect of hydriatics and the relative simplicity of its uses is a challenge to all in the medical profession who have sought in pharmaceuticals and costly apparatus the sole control of local circulation, the relief of pain and loss of function—a triad of symptoms intimately associated with local injuries and infections. It is a sad commentary on the instability of memory to realize that we, the acknowledged disciples of this historic branch of therapy, have often been most neglectful in stressing the beneficent nature of the thermal and mechanical action of water. Perhaps its very simplicity of use in the solid, liquid and vapor states has been a deterrent for its wider appreciation in that large clinical terrain where pain and loss of function play such a devasting role on our social and economic structure.

From ice to steam, internally and externally, hydrotherapy has provided surcease from pain throughout the ages. Especially has this supreme and simple remedy been rediscovered and utilized during and following the advent of wars. It is interesting to note how the consciousness of the medical profession has periodically become awakened to the value of water as a curative agent during such militant periods. Perhaps it is not stretching fact too far when we intimate that the fabulous State of California is now awake to its rich resources in spas and seashore resorts as well as other forms of institutional and bedside methods for the scientific application of water, because time is the great ferment and catalyst that stimulates research and clinical observations along certain patterns.

It is interesting to observe that the literature on hydrology has become more extensive in recent years. In Europe one notes that interest in this field is international in scope, and only the interruption of the warring nations has silenced the annual session of its multilingual Congress and the publication of many monographs that dealt with the action of hydrotherapy and hydriatics in relation to rheumatism and the like.

Dr. Moor's excellent report recalls our own interest in a related problem; namely, the action of thermal mud in arthritis and rheumatoid conditions. Since the results of our studies have already been published in the Archives of 1938 and 1939, a recapitulation is mentioned merely to throw greater light on the usefulness of this remedy. Twenty-five unselected cases of chronic arthritis and allied conditions were treated with topical applications of Fango to the entire exclusion of any indicated causal or symptomatic therapy. The fact that 80 per cent of the patients experienced decided improvement after a course of 20 applications and that the disability had not yielded to other forms of therapy in the past, is an index that should provoke serious consideration of the value of hydrotherapy as a superior, simple and excellent adjuvant in the treatment of painful and functional disturbances.

Dr. F. H. Ewerhardt (St. Louis, Mo.): It has been our privilege to treat injuries by means of physical measures for many years. Naturally we have tried the various means which have been at our disposal. In selecting a source of heat in the treatment of injuries to the muscle, ligament or joint, our first choice is the whirlpool; the next is the contrast bath, always remembering, however, that with this we should keep in mind rest by proper splinting. Diathermy may be used to advantage if the technic is correct, but it is our belief that because of improper technic much damage has been done to joints. Water as a medium to transfer heat is

simple and effective in its application and can be easily applied at home thus supplementing office treatment.

I am happy to confirm what Dr. Moor has brought out in his interesting and instructive paper.

Dr. Fred B. Moor (closing): I am obviously among friends this afternoon. In regard to the spa situation in California, we have there many excellent springs at various temperatures. There is a spring in the mountains east of San Diego which, I am told, has a temperature of 98 F. the year around. I do not know the exact temperature of Arrowhead Springs, but it is high. There are many springs in Southern California, and some in the northern part of the state, but, unfortunately, there is little or no medical supervision and, therefore, the situation is not satisfactory. We hope that physicians will become interested in our California spas and seek to develop them medically.

FUNCTIONAL DISORDERS OF THE FOOT AND THEIR TREATMENT *

DUDLEY J. MORTON, M.D.

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NEW YORK, N. Y.

Normal function is the basis of health; abnormal function means disorder or disease. This truism is particularly pertinent to the present subject for the following reason:

Modern medicine—or, one might say, twentieth century medicine—has been developed essentially on this functional basis. It has been accomplished by means of instrumental and other scientific forms of mechanical and impersonal analysis, in contrast to the earlier morphologic interpretations, which relied chiefly on personal and visual observations unaided by modern methods of analysis. Today, disorders of sight or of hearing, glandular or other internal ailments, heart or circulatory disturbances, are all met with appropriate tests to measure normal or abnormal function. In other words, twentieth century medicine thinks primarily in physiologic terms.

This is true in regard to all organs of the body with one exception—namely, the feet. The prevailing ideas of the foot and its disorders were established before 1900 and have remained practically unchanged for nearly fifty years. Does this not explain why foot disorders today are as widespread as they were a generation ago? And also why, with so vast a portion of the population seeking relief from these ailments, the medical profession has shown such complacency in letting them drift into the hands of nonprofessional commercial agencies?

Even diagnostic terms and concepts of foot disorders have the stamp of nineteenth century medicine. They are purely morphologic, relating directly to contour or visible change in contour; for example, "pronation," "pes planus," "depressed anterior metatarsal arches."

Few persons realize that inside the foot there is an important strictly localized, physiologic phenomenon as complete in itself as the phenomenon of refraction within the eyeball. The existence of such a functional entity inside the foot may be recognized more vividly if one pictures how difficult

* Read at the Twentieth Annual Session of the American Congress of Physical Therapy, Washington, D. C., September 2, 1941.

standing and locomotion are for a person whose legs have been amputated at the ankles. In fact, the internal mechanism by which the foot fulfills effectively the requirements of stance and locomotion offers a distinct similarity with optical refraction.

In the eyeball, light rays are transmitted through the lens and distributed on the retina. Any defect which disturbs the orderly distribution of these rays causes disordered vision, or function, and leads to eye strain with an increasing range of clinical symptoms. Extensive instrumental data have demonstrated that in a normal foot, body weight, received and transmitted at the ankle, is distributed through the foot's framework to its various points of contact with the ground in accordance with a definite ratio. Defects in the framework of the feet will distort the normal ratio of weight imposed on the supporting bony segments; the result is disordered function. This functional viewpoint provides a more accurate and satisfying explanation of the common types of "foot and arch disorders."

Let us restore a pair of normal, or ideal, feet to the unfortunate person referred to and briefly note their major functional and structural characteristics as indicated by instrumental analysis. In normal standing, body weight is equally divided between the heels and the forepart of the feet; on the metatarsals (I to V), lying immediately behind the toes, it is distributed in a ratio of 2, 1, 1, 1, 1, respectively. Thus, if the weight is 120 pounds, 60 pounds falls on each foot, with the heel supporting 30 pounds posteriorly, while in front the other 30 pounds is divided, 10 pounds to metatarsal I and 5 pounds to each of the other four. Thus, both length and breadth is supplied to each foot as an effective supporting base.

A vertical roentgenogram of these feet would show that:

1. The heads of metatarsals I and II are equidistant from the heel, with the two sesamoid bones lying directly under the head of metatarsal I.
2. The shaft of metatarsal I is about twice the diameter of each of the others; in the latter, the width and the thickness of the walls (cortex) are approximately uniform.

Such feet are mechanically stable, well balanced and proficient in meeting all functional demands, regardless of any variation in muscular strength other than of a distinct pathologic nature such as paralysis.

Now let us loosen the joints of the first metatarsal and of the cuneiform bone behind it, so that this entire segment is not so firmly bound to the foot. What are the effects on function and structure? Like the loose leg of a chair or table, it fails to give normal support when body weight is imposed on the foot. Consequently, (1) its double load must be supported by the slender metatarsal II beside it, inflicting excessive strain on the basal joints of the latter, and it greatly exaggerates pressure on the skin under the head of metatarsal II; (2) deprived of the buttressing support of metatarsal I on the medial side, the foot naturally rolls inward to an imbalanced posture, introducing abnormal strains on the joints along the inner border of the foot and ankle and imposing an unnatural burden on the muscles of supination and (3) body weight is deflected away from the outer border of the foot toward the inner side, increasing still more the general distortion in weight distribution. This type of disordered mechanics can clearly be recognized as of "longitudinal arch trouble."

Roentgenograms of the foot will reveal a definite enlargement of metatarsal II in comparison with the three outer ones. The shaft of this bone becomes widened and the thickness of its walls increased. Evidence of the looseness of the basal joints of the first metatarsal segment will be noted in the apparent spacing between cuneiforms I and II. Callus formation of

the skin under metatarsals II and III will be observed in adults and, as pronation increases, may subsequently appear under metatarsal I.

Let us now shorten metatarsal I instead of loosening it. Again we interfere with its ability to support its double share of weight. It acts like a short leg on a table. However, here the disturbance of weight distribution is most pronounced when the heel is raised as in locomotion or when high-heeled shoes are worn. Under these conditions, all the body stresses are thrown forward to converge and become concentrated on metatarsal II because of the more advanced position of its head. Again the focal points of symptoms lie in the overstrained basal joints of this bone and in the excessive pressure on the skin beneath its head; but the symptoms are more typical of what is usually termed "depressed anterior metatarsal arches."

Roentgen examination of such feet naturally reveals the shortness of metatarsal I and with it a corresponding hypertrophy of metatarsal II. In the case of more conspicuous disturbance, this enlargement may be so great that metatarsal II will be wider in diameter than metatarsal I, and sometimes it is three or four times stouter than the lateral bones. Callus in the middle of the ball of the feet is typical.

A third condition causes an effect similar to that of a short first metatarsal—namely, when the sesamoids lie rearwardly toward the neck of this bone instead of under the head. Since the sesamoids act as the bearing points for metatarsal I, their position obviously determines the functionally effective length of that bone.

The three conditions described have been shown by extensive investigation to be the predominating sources of functional foot disorders. They usually appear in combination rather than singly and, while present throughout early life, rarely cause painful symptoms until after maturity except in the more extreme postural cases in children.

Treatment

The usual explanation of these disorders gives "muscular weakness" as the primary cause. Therefore, special exercises would seem to be the logical procedure by which to overcome them. But, although this theory has long held professional favor, no statistics have ever been published to prove its accuracy. On the other hand, physiologic analysis indicates that these disorders are not of muscular origin but are due to disordered function traceable to deficiency in metatarsal I, so that excessive weight stresses are imposed habitually on the second metatarsal segment until its basal joints become chronically strained. In other words, these common foot ailments are actually strained joints—and should be treated like chronically strained joints in other parts of the body.

During the period of symptoms, therefore, rest and avoidance of weight bearing should be emphatically insisted on. Other measures familiar to physical therapeutists, designed to relieve nerve irritation and restore a normal state of the tissues inside the feet, are also most helpfully employed at this time.

Permanent relief requires a correction of the abnormal weight distribution comparable to the use of properly fitted eyeglasses for visual disorders. For this purpose an insole has been designed to establish the supporting effectiveness of metatarsal I by means of a platform-like element which is located beneath the head of that bone. This device (under the name compensating insole) has been developed under careful experimentation in order to make it easily available to the medical profession. Arch supports are

required in the cases of more extreme disturbance, in which the foot structure has been seriously broken down; in the vast majority of cases, however, proper general care and correction of weight distribution through use of such insoles will give superior results.

The present opportunity is hardly sufficient to do more than offer a few high spots of a new approach to the foot problem and to point out how it differs from the traditional concepts of foot disorders. Let me urge physicians who consider these foot ailments deserving of professional care to familiarize themselves with the significance of weight distribution on the metatarsal bones and to study such cases by means of the vertical roentgenogram. To do so will open a wide and important field of useful interest.

When we observe the great advances that physiologic studies have given in all other fields of medicine, why must we be satisfied with our heritage from the nineteenth century in regard to the feet? Not only is the time long overdue for improvement of that knowledge in behalf of the medical profession and the public generally, but with the critical return of our interest in things military, it would seem that the time for serious attention has actually arrived.

Discussion

Dr. James I. Kendrick (Cleveland): I would like to concur with Dr. Morton's opinion that foot problems should be approached from the scientific standpoint and should be met by recognized methods and not left in the hands of shoe quacks. I think that Dr. Morton's observations are keen and certainly are on sound anatomic and physiologic lines.

I should like to ask Dr. Morton whether after his platform appliance has been worn and the strain of the joints has been relieved, if it is possible to restore sufficient muscular strength to keep the stresses off these joints and to keep these patients comfortable without the use of appliances.

Dr. Jerome Weiss (Brooklyn): It has been said that "when the feet hurt everything hurts." The sore hand can be carried in a sling, but the painful foot must be walked on. Dr. Morton has presented a definite contribution to the better conception and treatment of a common and painful foot disorder. The substitution of rest for the exercise which is usually prescribed is sometimes obligatory, as total disability is not rare in these foot disturbances. This may prove a hardship to the patient in reduced circumstances, but it will materially hasten recovery. The role of pronation as a complication of foot disorders is important, and is stressed. Dr. Morton does not mention the role of tight posterior muscular groups of the legs in the production of foot disabilities. I would like to ask his opinion as to the importance of this syndrome.

Major Leonard T. Peterson (Washington, D. C.): Men are not accepted for military service who obviously have deformed or flat feet. The first problem is to determine whether or not a man is physically fit for military service. To do this we must rely on physical examination and inspection. Obviously, it is not practicable to have a roentgenographic examination of each candidate's feet to determine whether or not he is fit for service.

From those who have entered the military service, especially new recruits, we receive many complaints of painful feet. These persons have changed suddenly from an inactive to a military life, have changed their footwear, have new duties, have new disciplines, and have many unpleasant experiences.

Of the men who are in military service, we must decide who are unsuited to continue. This decision is based on the physical examination, and if necessary, roentgenographic studies. Those men who are not suited are promptly separated from the military service. Of those who remain, many who have painful feet, desire to remain in the service and are helped by means of proper support and treatment. For recruits a period of conditioning is necessary. Many will improve over a period of weeks.

However, there remains a large group of men who are seeking some means of escape from the army. Many of these are psychoneurotic. For these we should like to have some test such as Dr. Morton mentions, using roentgenographic examination, if possible to determine those who are malingerers. Unfortunately, the problem is not so simple.

Pes cavus is especially disabling, and should be a cause for rejection for active duty.

We recognize that roentgenograms should be taken in any case in which there is localized pain. Many times pathologic conditions, such as arthritis, deformities, or march fracture are discovered. I was especially interested when, in conversation with an officer on duty at a post of 15,000 soldiers, he stated that during his stay of five months at that post, he had taken roentgenograms of many feet and had found 5 cases of march fracture. This seems to be an unusually high incidence. Obviously, for this type of condition, rest is required. The concept of resting a pain-

ful foot, which has been proposed by Dr. Morton, is not so adaptable to the military service; if we begin to rest painful feet, we are going to have our hospitals full of soldiers who desire rest, so we have to treat them by means of support, conditioning, and as much exercise as can be tolerated.

If we follow the concepts which Dr. Morton has presented, I think we shall improve in our diagnostic and therapeutic ability.

Dr. F. H. Krusen (Rochester, Minn.): I should like to ask Dr. Morton to discuss for a moment, if he will, the relative merit of the platform insole and the externally applied so-called metatarsal bar.

Dr. C. P. Halstead (Washington, D. C.): I have been particularly interested in this type of work for some time. Numerous persons have come to me complaining of their feet, and I have been at a loss to explain just what the difficulty is.

A thorough history will show that most of these patients did not have many symptoms until they were about 18 or 20 years old. I think that is due to the fusion of the epiphyseal junction. I have 150 patients now, and I have a series of 250 roentgenograms. All of these patients have shown clinical symptoms. Ninety per cent of this number has shown 80 per cent improvement, that is, return to a normal functioning foot. My experience has shown that the pad must be worn all of the time, because it serves as a compensating mechanism. Therefore, there is going to be no adjustment made in the actual weight bearing unless this compensation is carried out indefinitely. I think that this is probably a method of approach to a quick remedy for painful feet which all physicians see, and it should be their duty to try to determine what can be done for the patient.

Dr. Dudley J. Morton (closing): In regard to the question with reference to muscles of the calf of the leg, I did not enter into that because of limited time. Shortness of the calf muscles, of course, is a direct factor in disordered weight distribution on the foot; for in locomotion, as soon as the leg passes the vertical short calf muscles force the foot into an abnormal, pronated position. Muscular spasm, as a symptom, is secondary to chronic joint strain and the nerve irritation within the foot.

In so far as the Army problem is concerned, that naturally lies with the medical authorities of the Army. I do feel, however, that in any approach toward the control of foot disorders the most scientific method employed will insure the best solution.

I think Dr. Kendrick holds to the idea that there is consistently an associated muscle weakness in these cases. We made examination of the feet of nurses at the Presbyterian Hospital, in order to study the muscular strengths of normal feet, and of those with first and second degree pronation. We found that weakness of the supinators was more common in normal postured feet than in those with second degree pronation. This result is the opposite to what prevailing ideas had led us to believe. In first degree pronation, relative muscular strengths conformed closely with what was found in normal feet. These results indicate that muscular weakness is not consistently nor characteristically associated with functional foot disorders. The fault lies primarily in the framework of the foot. If the framework is not solid and stable, the foot is bound to yield under body weight. I have attempted to show that the predominating cause of these disorders lies in a "deficiency" in the first metatarsal segment. Consequently for correction, a building up, or elevation of the supporting surface beneath the head of metatarsal I creates a condition where this bone is made to carry the weight it is supposed to. When it carries its proper share of weight, the weight tends to be automatically readjusted on all the other metatarsal bones, particularly the overload upon the second metatarsal.

The causal conditions are hereditary. Short, first metatarsal bones follow right down a family strain. Looseness of the first metatarsal bone apparently is also a hereditary condition, but it may also be acquired or exaggerated in early childhood through debilitating illnesses.

Let me add one point, that when such a condition is present in the framework of the foot, there is nothing I know of, short of a more or less radical operative procedure that can eliminate it. Therefore, it should be regarded in the same light as a defect in the lens of the eye which produces astigmatism. You cannot expect to get rid of that, you merely apply glasses to compensate for the defect. And, you continue the use of such compensating means for permanent relief.

Let me close by emphasizing the chief purpose of this paper. When the study and treatment of the common foot disorders are lifted from a nineteenth century concept to a more scientific functional basis, as characterizes twentieth century medicine, then we shall make real strides toward a solution of the "foot problem." Responsibility for this step lies directly with and on the medical profession.

THE ROLE OF SPAS IN MEDICAL PREPAREDNESS *

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The symposium on medical preparedness which was presented at the 1941 Annual Session of the American Medical Association stressed repeatedly the necessity for developing every means which will contribute to the better health of both our military and our civilian population. Parran[1] stated, "It is our task to make our men as good as our machines." Abell[2] commented graphically, "Without health, participants in industrial production, and members of the armed forces become liabilities rather than assets." Seeger[3] pointed out that one of the four objectives for industrial medicine is "the instruction of the worker in healthful living."

The challenge is therefore before us to utilize all available methods and facilities to accomplish the goal of a healthy nation. This should be our goal at all times, not only during the present emergency but also in times of peace. The facilities available in the spas of the United States if properly coordinated can be used as one means of reaching this goal. The therapeutic program of the spa which is built around its mineral waters and other natural agents can be used to advantage in this program of preparedness.

The spas of Europe are being used for this purpose both to condition men for service and to care for soldiers who have suffered from injury or illness in service. During the past winter it was reported that the German Army Command arranged for the regular furlough of soldiers from line duty so that they could spend the period at the different spas. Schnelle[4] reported that beneficial results were obtained with baths for joint injuries and infections resulting from war injuries. He described four degrees of stimulation to healing dependent on the type of mineral water used. The mildest stimulation was obtained from water with a low mineralization, the next degree with warm brine baths, a still greater response with warm sulphur waters and the greatest with moor and mud baths. He also recommended the use of carbon dioxide gas for poorly healing wounds of the extremities, which were treated in chambers containing high percentages of the gas.

Mougeot[5] in France stressed the value of the carbon dioxide baths at Royat in treating soldiers with unstable hearts or with hearts which were forced beyond their reserve by exertion. Villaret[6] reported a plan developed by the French Commission on Mineral waters for the regular care of the war wounded in the various hydromineral and climatic stations of the country.

The spas of the United States contain a wide variety of mineral waters which can be applied in a program similar to those reported from abroad. The thermal waters of Hot Springs, Ark., Hot Springs, Va., and other places are comparable to the famous waters of Wiesbaden, Baden Baden and other spas abroad. Sulfur waters are available at French Lick, Ind., White Sulphur Springs, W. Va., Sharon Springs, N. Y., and elsewhere. Brines suitable for a variety of treatments are found at Mount Clemens, Mich., and Watkins

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Glen, N. Y. The waters of Saratoga Springs, N. Y., contain large quantities of carbon dioxide, which is widely used abroad for the treatment of disorders of the heart and circulation. These are only a few of the many mineral waters found in the United States, which has within its borders as great a variety as is found anywhere in the world.

In the usual program of spa treatment the patients live at the hotels or boarding houses in the community and take their treatments either in the hotel bathing section or at a central bath house serving the entire community. In some places only a small number of patients can be cared for, while other places have facilities for thousands.

I have recently reported on the facilities for treatment available in New York state.[7] The present communication presents similar data for the United States. Information regarding the health resorts of our country is being assembled by the Committee on American Health Resorts of the American Medical Association. I am particularly indebted to the committee for permission to use certain data from its files. In addition, the material has been supplemented by details from other sources, such as the Red Book of the American Hotel Association. No attempt has been made to assemble information regarding the very large number of both inland and seashore resort accommodations where climate or sea bathing is the principal feature. The number of these accommodations would be vastly greater than those in strictly spa localities.

The data to be presented must not be considered as a complete survey, as the present information has not been obtained on a common basis from all places. It is presented to show the extensive facilities already at hand for the accommodation of patients at the various spas and to stress their use in the present preparedness program and in war if it comes.

Analysis of Data

The material has been assembled according to states, the number of localities where spa facilities are available and the total number of accommodations for guests in each state being shown. The information presented in table 1 indicates that there are spa facilities in 103 localities in 33 states,

TABLE 1. — *Spa Facilities According to States.*

States	Number of Localities	Total Accommodations	States	Number of Localities	Total Accommodations
Alabama	3	665	Montana	4	300
Arizona	2	119	Nevada	2	74
Arkansas	1	20,412	New Mexico	5	1,161
California	23	4,768	New York	6	10,145
Colorado	2	830	North Carolina	3	175
Florida	3	430	Oklahoma	2	1,030
Georgia	2	457	Oregon	3	350
Idaho	2	180	Pennsylvania	2	855
Illinois	1	75	South Dakota	1	435
Indiana	5	1,955	Tennessee	3	680
Iowa	1	110	Texas	3	1,988
Kentucky	1	165	Utah	1	10
Maine	1	640	Virginia	5	1,493
Michigan	3	2,755	West Virginia	4	1,815
Minnesota	2	155	Wisconsin	1	595
Mississippi	2	310	Wyoming	2	275
Missouri	2	2,084	33 States	103	57,491

with accommodations for 57,491 patients. This leaves 15 states without any developed spa facilities.

There is a wide range in the size of the institutions reported. An indication of this variation is shown in table 2. A total of 83 localities have

facilities for less than 500 patients each, while there are only 11 which can care for 1,000 or more.

As is shown in table 3, 11 states can care for over 1,000 patients each, and in 9 of these states are 12 individual spa localities which can care for 1,000 or more patients each. These 11 states have approximately 85 per cent of the available facilities, a fact which is influenced largely by the extensive development of the waters of Arkansas and New York.

Of importance for preparedness is the general distribution of these facilities. Table 4 shows the accommodations available in each Army Corps Area. With the exception of the First Corps Area, each area has accommodations for over 2,000 patients. Also, each corps area except the first and fourth have individual localities which will accommodate 1,000 or more

TABLE 2. — *Spa Facilities According to Number of Patients Who Can Be Accommodated.*

States	Number of Localities With Accommodations				States	Number of Localities With Accommodations			
	Under 500	500-1000	1000-5000	Over 5000		Under 500	500-1000	1000-5000	Over 5000
Alabama	3	....	....	....	Montana	4	....	....	....
Arizona	2	....	....	....	Nevada	2	....	....	....
Arkansas	....	....	....	1	New Mexico	5	....	....	....
California	21	1	1	....	New York	3	....	2	1
Colorado	1	1	....	....	North Carolina	3	....	....	....
Florida	3	....	....	....	Oklahoma	1	1	....	....
Georgia	2	....	....	....	Oregon	3	....	....	....
Idaho	2	....	....	....	Pennsylvania	1	1	....	....
Illinois	1	....	....	....	South Dakota	1	....	....	....
Indiana	3	1	1	....	Tennessee	3	....	....	....
Iowa	1	....	....	....	Texas	1	1	1	....
Kentucky	1	....	....	....	Utah	1	....	....	....
Maine	....	1	....	....	Virginia	4	1	....	....
Michigan	1	....	2	....	West Virginia	3	....	1	....
Minnesota	2	....	....	....	Wisconsin	....	1	....	....
Mississippi	2	....	....	....	Wyoming	2	....	....	....
Missouri	1	....	1	....	Total	83	9	9	2

TABLE 3. — *States With Largest Accommodations.*

		Number of Localities	1,000 or Over
1.	Arkansas	1	20,412
2.	New York	6	10,145
3.	California	23	4,768
4.	Michigan	3	2,755
5.	Missouri	2	2,084
6.	Texas	3	1,988
7.	Indiana	5	1,955
8.	West Virginia	4	1,815
9.	Virginia	5	1,493
10.	New Mexico	5	1,161
11.	Oklahoma	2	1,030
	Total	59	49,606

patients. This demonstrates the national scope and wide distribution of the spas of the United States.

Comment

In a consideration of the importance of these facilities in medical preparedness, the type of accommodation, the nature of service rendered, the indications for the use of the services and the possibilities for proper medical direction are all determining factors in the evaluation of how great or how extensive their role may be.

Type of Accommodations. — At the usual spa the accommodations are primarily for the patient who is ambulatory, and they range from the large

hotels which can care for 1,000 people to individual rooming houses, which may care for only 4 or 5 patients at one time. Between these two extremes are smaller hotels, sanatoriums and boarding houses with a range of 10 to 100 or 200 patients at a time.

In the spas where the largest facilities are available, there is generally a variety of these types of accommodations at many different price levels. This is an important factor in the wide use of the facilities.

Many of the hotels at spas are not suitable at present for operation during the entire year, as they are normally open only for the active summer season. This is more particularly true of spas in the Northern sections of the country. However, selected localities could be chosen where the remodeling of the accommodations for year-round operation would be minimal.

Special Treatments Available. — In addition to housing patients, the spa provides methods of treatment utilizing the mineral water or other natural agents of the community. Space does not permit a review of the types of mineral waters found in each spa, but they range from lightly mineralized thermal waters to strong brines containing as high as 15 per cent mineralization. Chlorides, sulfates and bicarbonates of the bases sodium, potassium, lithium, calcium, magnesium, iron and others are found in various combinations. Also, gaseous constituents, such as carbon dioxide, hydrogen sulfide and radon, influence the therapeutic effect.

TABLE 4. — *Spa Facilities According to Army Corps Area.*

Army Corps Area		Number of Localities	Accommodations
I	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut	1	640
II	New York, New Jersey, Delaware	6	10,145
III	Pennsylvania, Virginia, Maryland, District of Columbia	7	2,348
IV	South Carolina, Tennessee, Louisiana, North Carolina, Alabama, Georgia, Mississippi, Florida	16	2,717
V	Ohio, West Virginia, Indiana, Kentucky	10	3,935
VI	Michigan, Illinois, Wisconsin	5	3,425
VII	North Dakota, South Dakota, Nebraska, Minnesota, Kansas, Iowa, Arkansas, Missouri, Wyoming	9	23,471
VIII	Colorado, Arizona, New Mexico, Oklahoma, Texas	14	5,128
IX	Washington, Montana, Oregon, Nevada, Utah, California, Idaho	35	5,682
	Total	103	57,491

In the utilization of these natural agents, there are bathing establishments where 2,000 or more people can be accommodated per day. In the smaller spas the physical plant is commensurate with the number of people who can be housed. In a few spas, only the internal use of the mineral water is possible as they do not maintain a bathing establishment.

In general the mineral waters are used both externally and internally. For external use, baths in the mineral waters are the center of the treatment program. The waters are also frequently used for preparing hot packs, and in some places they are nebulized and inhaled. In addition, electric cabinets, water rubs and douches are available for a general hydrotherapeutic regimen. Massage, exercise, and electrical and light treatments are used to supplement the general therapeutic program. Spa therapy therefore includes a regulated program of these various treatments, with regulated diet, rest and recreation.

Indications for the Treatments. — The patients who benefit by the spa program include many with chronic conditions affecting the circulatory, loco-

motor and gastrointestinal systems. The treatments are also widely applicable in the convalescent care of patients who are recovering from acute medical or surgical conditions which have required hospitalization and who may require further rehabilitation before returning to work. They also have a large place in obtaining the maximum build-up of reserve during a health vacation.

The spa regimen is not in general suited to the care of patients suffering from pulmonary tuberculosis, mental disease, malignant conditions or any ailment requiring hospitalization and rest in bed.

Medical Control. — In nearly all localities where spa facilities are available the physicians of the community are familiar with the waters and treatments and can adequately direct the program for the patients undergoing treatment. In a few places, physicians trained in balneotherapy are regular members of the staff of the institution.

The Relation of Spas to Medical Preparedness. — The spas can aid in the treatment of patients with chronic conditions so that many may return to industry in positions suitable to their limited ability to work. This is particularly true for many patients with cardiac conditions, for whom a sojourn at a spa once or twice a year helps to continue their regular work. Rheumatic disease takes a tremendous toll among workers, and many patients with this disease can be helped by spa therapy to return to their occupation sooner. Also, in the field of chronic disease, the use of spa treatment will help many patients to carry on at home who otherwise might become worse and require treatment in hospitals.

Spa facilities can be utilized to release regular hospital beds for acutely ill patients. If suitable places for convalescence were available, physicians could release their patients from the general hospital sooner, thus freeing the beds for others. The 1940 report of the hospital service of the United States[8] listed 462,360 general hospital beds, which cared for 9,219,496 patients during the year. As the average stay at a spa is three to four weeks, it would be possible to accommodate between 500,000 and 600,000 patients per year with the present spa facilities. It is true that the distance of the spa from the home community may be too great for some patients to travel, but there are many who could be sent if a coordinated plan were developed which would aid in relieving the congestion in hospitals.

In the field of industrial medicine, where it is reported[2] that the aggregate number of days lost because of illness of workmen reaches the astounding figure of three hundred forty million work days per year, the spa has two points of contact: first, in the more rapid rehabilitation of the sick or injured worker, and, second, for workers' vacations, so that they may return to industry in better physical condition. The importance of the second phase is stressed particularly for the executive staff, whose hours may not be regulated by law and who are responsible for accelerating industrial production during the present emergency.

Our army and navy personnel can also benefit from the spa regimen. The average soldier on furlough uses his time in a round of parties, late hours and exhausting travel, which return him to duty tired and exhausted. There are real possibilities for benefit in a furlough spent at a spa. Also, in convalescence from illness developing at camp the spa can play a role. In addition, as noted in the reports from France and Germany, the treatment of war wounds may be facilitated by the regulated application of mineral waters and moors to speed healing and reduce the degree of temporary and permanent disability.

Turning to the role of spas in maintaining civilian health, it is not necessary to repeat the suggestions made for the industrial worker or the military man, as they apply equally well to these. In war today, in which extensive aerial bombing is occurring, civilian casualties may equal or exceed in number those of military forces. Therefore, war wounds are not limited to soldiers. In the rehabilitation of injured civilians also, treatment at a spa can be utilized.

In putting the suggestions made into operation it would be possible for representatives of our military and public health services to develop a plan for the use of the facilities of the 12 largest spa localities in 9 different states and 7 corps areas as centers for the initiation of the therapeutic program. In the remaining 2 corps areas smaller units could be used. It is true that there are not sufficient accommodations of this type available to provide for all the civilian and military requirements which have been suggested, but there are many resort areas both inland and on the seashore where a portion of the program can be developed and where health-supervised vacations can be made available. With the facilities already at hand a start can be made in providing medically supervised programs which will build morale and improve the health of all our citizens.

Summary

1. A summary of accommodations available in the spas of the United States is presented. There are 103 localities with space for 57,491 patients.

2. The natural resources of the spas offer opportunity for a type of treatment which has a wide application and which can supplement excellently the program of medical preparedness for our military and civilian population.

3. The wide geographic distribution of these facilities in all Army Corps Areas makes practical the consideration of a general plan for their greater use and development.

4. The spa facilities must not be neglected in our plan for the better health of the nation during the present emergency or in the long range plan to keep our people fit at all times whether in war or in peace.

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NOTE: Discussions will appear in a later issue. — ED.

THE CERVICO-BRACHIAL SYNDROME *

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After reviewing thirty-two articles on cervical ribs and the scalenus anticus syndrome, one gets the impression that they are two entirely different entities and that the only treatment is removal of the cervical rib or section of the scalenus anticus muscle. Several surgeons with extensive experience on the subject admitted that they only operate on 15 to 20 per cent of the patients they see suffering from the foregoing entities. Very little is written on the treatment of the 85 per cent who are not operated on. It therefore seems rational to analyze more closely the nonoperative cases. The patients are usually referred to the department of physical therapy. This paper is an attempt to put the conservative treatment of the cervico-brachial syndrome on a scientific basis and possibly save some patients from the haphazard, empiric treatments to which they now are exposed.

Types of Conditions

There is a clinical entity that consists of the following symptoms in various degrees:

1. Neurologic complaints of pain in the neck, over the scapula, under the clavicle, down the shoulder and upper extremity and into the hand along the radial, ulnar or median nerves.
2. Vascular complaints with diminished pulse or blood pressure on the affected side.
3. Vasomotor symptoms of ischemia or temperature changes.
4. Tenderness on pressure over the scalenus anticus muscle or the brachial plexus.

All these symptoms are related to the anatomy of the neck and the superior outlet of the thorax. This outlet is completely surrounded by rigid bony structures. Behind is the cervico-thoracic spine, laterally the first rib and in front the sternum. The lower fibers of the brachial plexus, the autonomic nerve supply to the arm and the subclavian artery and vein must pass over this rigid outlet. These structures form the apex of an arch as they pass over the first cervical rib. If this rigid arch is compared to a pulley over which the subclavian vessels and the nerve fibers are more or less stretched, several conditions which might increase the tension and pressure on these structures can be visualized.

1. The first rib may be placed high.
2. An extra cervical rib may raise the pulley.
3. A spastic scalenus anticus muscle may lift the thoracic cage.
4. There may be an increased traction from within the thoracic cage. I have seen the syndrome develop after a pneumothorax.
5. There may be increased traction by the scapula or the upper extremity.

High First Ribs. — In many cases of cervico-brachial syndrome roentgenograms rule out cervical ribs. There are no symptoms over the scalenus anticus muscles; still there is evidence of pressure and the first rib is found to be higher up than usual. The rib is flat, with a transverse ridge in the middle of the scalenus tubercle.

Cervical Ribs. — Dr. Patterson has given a detailed description of the anatomy of the cervical rib. He considers such ribs to be congenital recessive

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atavisms which arise at unstable areas of the spine, i. e. the cervico-dorsal and the lumbo-dorsal areas. He describes four types of cervical ribs which usually come off the seventh cervical vertebra. The first type is only an increase of the costal process. The second type is a rudimentary rib extending beyond the transverse process and usually having a free end. The third type is a well developed rib which extends to the costal cartilage of the first rib and is often united to it by a ligament. In the fourth type a fully developed rib actually articulates with the first costal cartilage or the sternum. Any one of these types may be unilateral or bilateral. These structures lengthen the thorax by the width of one rib.

The incidence of cervical ribs in the general population is about 0.5 per cent. Any of the four types may produce symptoms. These are due to direct pressure, producing stretching, compression or friction against the vital structures passing through the scaleni triangle. Although cervical ribs are usually bilateral, the symptoms are mostly unilateral. Only about 5 to 10 per cent of persons with cervical ribs will have symptoms. Although distribution of cervical ribs is about equal in both sexes the symptoms are three times more common in women.

Scalenus Anticus Syndrome. — The scalenus anticus syndrome is often described as an entity, but I believe it is only rational to assume with Naffziger that injury, excessive occupational strain or poor musculature may cause the shoulders to droop and precipitate the signs and symptoms of the cervico-brachial syndrome. As mentioned before, the lower roots of the brachial plexus and the subclavian artery arch upward over the rib cage. In addition to this angulation, these structures pass over the edge of the scalenus anticus muscle, which thereby holds them back or in a more posterior position. A cervical rib may push the scalenus posticus and medius muscles forward and thereby further constrict the space between the scaleni muscles through which the subclavian vessels and the brachial plexus must pass.

Increased Traction From Within the Thoracic Cage. — It seems conceivable that traction of structures which pass over the upper rim of the thoracic cage from the attached organs within the thorax may also produce the symptoms under discussion. With a pneumothorax there may be enough pull from inside to exert pressure and stretching of blood vessels and nerves over the pulley, i. e. the apex of the thoracic cage.

Increased Traction by Scapula or Upper Extremity. — Certain types of persons because of their body mechanics are predisposed to cervico-brachial symptoms. They have what is usually designated as poor posture. Such persons are of the long narrow asthenic type. The cervical spine seems unusually long, and the scapulas are low and tilted outward and downward. The angle formed by a vertical line along the posterior spinal processes to the seventh cervical vertebra, which is prominent, and from there to the acromio-clavicular joint is less than 90 degrees in an average person. With poor posture this angle measures more than 90 degrees. These patients have a pull from outside the thoracic cage against the thoracic rim. There is, therefore, a highly placed rim or pulley with increased traction from inside or outside the thorax. I have one patient who was treated for a fractured olecranon by means of a heavy plaster cast when cervico-brachial symptoms developed.

The child is born with a relatively high position of the scapulas, which are opposite the third or the fourth cervical vertebra, as in the anthropoid ape. A gradual descent takes place, and at puberty the adult position is reached. In the female the descent is greater, and this may account for the greater incidence of the symptoms of pressure in the female — the ratio being 3 to 1. It also explains the rarity of symptoms before adolescence. Some of these conditions are congenital. However, the symptoms do not appear until the third or fourth

decade of life. It is true that some observers have blamed occupational stress, such as housework, but the real cause is probably congenital predisposition. However, on this is superimposed the loss of muscular tonus as an exciting cause.

Treatment

1. *Rest and Support.* — In cases of acute symptoms the patient should be put to bed with the arms suspended over the head. This gives relief to both circulatory symptoms and nerve irritation. When the occupation or some form of work or exercises is suspected as a contributory cause the patient should stop the activity. If he remains ambulatory a sling will be necessary. This should carry the weight of the extremity.

In cases of descended scapulas, round shoulders, a figure eight bandage will take the strain off the nerves and blood vessels. The best figure eight bandage is made by a stockinet through which a flannel bandage has been passed and held together by two safety pins. An airplane splint when available serves the purpose of support and elevation well. When an airplane splint is not available an inexpensive substitute is made of specialist plaster. This is molded over the crest of the ilium, up the flank and high into the axilla, continuing at about a 75 degree angle under the arm, elbow and forearm with support for the hand. This plaster cast when hardened is held in place with straps and a ring of Mexican felt around the opposite shoulder. This can be worn under the clothes and is inconspicuous.

2. *Exercises.* — *(a) Exercises of Position:* These consist of maintaining the shoulder high and the arms over the head. This pose will relieve pressure over the bony rim or the scalenus anticus muscle. The head is carried slightly forward to release the scalenus anticus muscle. It is the same position as that in the back stroke crawl at the top of the stroke, when the arm is extended overhead. The neck firm position is also useful — the upward reach and the hanging by the hands on an overhead bar.

For severe circulatory involvement with edema we make use of vasomotor exercises similar to those used in the treatment of endarteritis of the lower extremities. The extremity is elevated until the finger tips become white, and then lowered in a hanging position until the fingers become dark red. After these two positions the arm is rested horizontally for two minutes, and the procedure is repeated for half an hour.

(b) Active Exercises: These exercises may be divided into local exercises for the shoulder girdle and general postural exercises.

(1) *Local Exercises:* Our problem is to increase the tone and thereby the carrying power of the muscles that help to hold up the shoulder girdle. The shoulder girdle is hinged in the sterno-clavicular joint and can move upward and downward as well as forward and backward. The weight of the shoulder girdle and the attached upper extremity is counteracted by the trapezius muscle, the levator scapulae and possibly the upper rhomboid muscles. In ordinary life the shoulder girdle acts as a more or less fixed point, and the upper extremity with the hand is the active movable point. In treating patients with cervico-brachial syndrome we try to reverse the order. By clasping the hands together we fix this point and teach the patients to move shoulder girdle toward the ear and toward the spine. These exercises should be performed for ten minutes three times a day.

(2) *General Postural Exercises:* Most patients with the cervico-brachial syndrome have poor body mechanics. The sloping shoulders go with an increased dorsal kyphosis, which is accompanied with an increased lordosis and tilted pelvis. Therefore, general postural correction should go hand in hand with the local treatment. The only difference from the usual correction of body mechanics is in connection with the head and neck. If the head is held high and chin is

pulled in, we may exert traction on the scalenus muscles and thereby raise the thoracic rim. The head correction is best omitted or at least modified.

3. *Heat.* — To relieve the irritation of brachial plexus and to relieve spasm of the scalenus anticus muscle we use heat from an infra-red lamp, short wave diathermy or conventional diathermy. This should be directed to the offending area. If you want to relieve spasm of the scalenus anticus muscle direct, you apply heat or short wave diathermy over this area. If you wish to relieve pain in the region of the brachial plexus concentrate the heat there. The circulation, nutrition and tone of the trapezius, levator scapula and rhomboid muscles are improved by massage. In massage the neuritic radiation of pain should be avoided.

4. *Surgical Treatment.* — Most of our present knowledge of the cervico-brachial syndrome we owe to the surgeons. With the advent of the x-ray numerous articles on cervical ribs appeared. By 1912 Keen had operated on 43 patients. Adson and Coffe in 1927 first recommended section of the attachment of the scalenus anticus muscle to relieve pressure. Patterson and Donald speak of cases in which both cervical rib resection and scalenectomy are indicated. However, the number of patients operated on is a small percentage of all the patients that present themselves with cervico-brachial symptoms.

Conclusion

1. Cervical ribs, spastic scalenus anticus muscle and poor posture may produce identical symptoms.

2. The common cause in all cases is probably a lowering of the tonus in muscles supporting the scapular weight. The irritation, traction and pressure on the cervical nerves and subclavian vessels of the first rib, a cervical rib or a spastic scalenus anticus muscle in all probability explain the cervico-brachial syndrome.

3. This syndrome includes pain along the brachial nerves, vascular changes of pulse and blood pressure, vasomotor symptoms of pallor, cyanosis and changes in temperature and, in addition, tenderness over the scalenus anticus muscle and the brachial plexus.

4. The conservative treatment of rest and support, heat to relieve pain and spasm, massage to increase muscular tone and exercises to build up muscular support is essential. Postural correction of body mechanics is important. Although surgical interference is necessary in a small percentage of cases and circulatory failure in the arm may mean an emergency operation, the majority of the cases respond to conservative treatment as outlined here. Even in operative cases the procedure outlined here is of complimentary importance.

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SYPHILIS TREATED WITH FEVER THERAPY IN PENAL INSTITUTIONS *

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The problems of a prison medical director are many, but none has been more difficult in the past to solve than the care of syphilitics, especially those with the disease far advanced.

The treatment of syphilitic patients in a penal institution presents a somewhat different picture than their treatment in private practice. In the first place, we are able to watch our patients more closely clinically and often follow them over long periods of time. In the second place, we must keep the taxpayer of the state in mind. The inmate must be given the cheapest and most effective treatment available to large groups rather than to the individual patient. We must constantly keep in mind that 95 per cent of the men in prison eventually must return to public life, and we must maintain their health so that they may return to society able to care for themselves and not as bed-ridden patients or sources of infection to others.

It became apparent several years ago that our treatment of syphilis, in spite of intensive chemotherapy, was extremely unsatisfactory, and that in this field we had left much to be desired. In far too many cases dementia paralytic or tabes dorsalis developed under our very eyes in spite of this intensive chemotherapy program and the patient had to be transferred to the state hospital for the insane. After observing for a long time the methods of handling patients with syphilis, particularly those with involvement of the central nervous system, I rejected malaria fever as a successful source of treatment for our penal institution. With us therapy must be handled on a large scale with a very small staff of technicians. Inmate nursing care does not lend itself well enough to this work for the safe handling of large groups of malarial patients. Furthermore, about 40 per cent of our inmates are southern born and have an acquired immunity to malaria. Among the problems of a prison administration is the smuggling in of contrabrand, such as narcotics and guns. If these things can be successfully brought in, then malaria fever can be controlled with quinine acquired in this manner. In any penal institution group treatment rather than individual treatment is necessary because of the large number of men to be handled, and it is my experience that malaria fever cannot be successfully handled in this way.

After watching the early work with artificial fever, it seemed that here might be the answer to our problem. Today I am sure that when used in conjunction with chemotherapy it is by far the best treatment available for institutions of our type.

Let us review the data compiled at the State Prison of Southern Michigan: As of Aug. 1, 1941, we had made 40,193 Kahn blood tests; of these, the reactions in 88 per cent were negative and in 4,748, or 12 per cent, were positive (table 1). That means a large number of men, a fair-sized city, to be treated, even over a period of years. Several things are obvious. With so large a group with positive reactions to the Kahn blood test, there must be many persons with involvement of the central nervous system. Just how many, no one could say. Beginning in

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January, 1937 we insisted that any man entering the institution with a positive Kahn reaction or with a history of syphilis must have a lumbar tap for examination of the spinal fluid in conjunction with his physical examination. To date

TABLE 1. — *Data on Kahn Blood Tests.*

Total admissions to Aug. 1, 1941		40,193
Total number of negative reactions	35,435 or 88.0%	
Total number of positive reactions	4,758 or 12.0%	

we have completed 1,707 original spinal taps. Of these, 323, or 18.8 per cent, showed a positive reaction of the spinal fluid in the Kahn test, and many also had far-advanced paretic Lange gold curves (table 2). Thus, approximately 19

TABLE 2. — *Data on Kahn Blood and Spinal Fluid Tests.*

Jan. 1, 1937, to Aug. 1, 1941		1,707
Total number of negative spinal fluid reactions	1,384 or 81.2%	
Total number of positive spinal fluid reactions	323 or 18.8%	
Total number of positive spinal fluid reactions		323
Total number with positive blood reactions	295 or 91.4%	
Total number with negative blood reactions	28 or 8.6%	
White	193 or 59.8%	
Colored	130 or 40.2%	

per cent of our syphilitics had involvement of the central nervous system. It seems to me that here is a fairly large percentage of our population which, in spite of the intensive chemotherapy, were not receiving adequate treatment. We had to say to the people of the State of Michigan: "Here is a percentage of your prison population potentially inmates for the state hospital and potentially crippled, either mentally or physically. Here are dangerous men, in a condition we are doing little to prevent."

To correct this condition so far as was possible we purchased artificial fever equipment and began the administration of fever in the advanced cases. This equipment, as well as the equipment we subsequently purchased, is of the electromagnetic induction type, combined with cabinet. We have been operating three installations of this type since then, and after 20,726 hours of treatment I am convinced that this is the most successful method of elevating the patient's body temperature. We have never had a fatal accident. We have had only 8 deaths of patients during the course of treatment, and none directly attributable to fever therapy.

Now briefly to describe the type of treatment we are offering: I should like to say that we do have technicians trained in the ordinary sense to operate our equipment. I have taken inmates from the general group of the institution and trained them to do this work. We have three physicians for a two hundred bed hospital. These physicians must take care of 5,500 men, with no other specially trained help, not even laboratory technicians. As a consequence, we have not been able to do the research work and to follow the fever patients from a laboratory standpoint as we should have liked. Our treatment has worked itself out of a cut and try method. In other words, we have depended on our clinical results to tell us just how much fever to give and for how long. Today we give a six hour treatment, maintaining the patient's temperature at 106.4 to 107 F. It is our plan to get the temperature up in thirty to forty-five minutes. This I believe to be the most successful method of administration of fever that we have tried. Clinically it has given the best results.

Our fever patients are strictly ambulatory. They come to the hospital the night before their treatment and are prepared in the following routine manner.

They are given 1,000 cc. of a fat-free beef broth containing 2 per cent dextrose, 2 per cent gelatin and 2 per cent sodium chloride, after the method of Dr. Schmitt, in addition to their normal intake. The morning of the treatment, after being checked physically they are given a hot shower and then placed directly in the cabinet, their temperatures already slightly above normal.

We feel that much of the secret of our success with fever therapy lies in the treatment from this point. First of all, we attempt to maintain the environmental temperature as low as possible. This we feel accounts for the relatively slow pulse that we are able to keep during the treatment. Secondly, I firmly believe that we must elevate the temperature of the patient as rapidly as is safely possible. I believe that the sudden shock of the high temperature held over the long period gives the best results and perhaps is the secret of good fever therapy. If a patient's temperature can be elevated in thirty minutes I feel that this is desirable. The height of the temperature and the manner of procedure during the treatment we consider individually, with the patient's individual reactions to the high temperature always in mind. We try to maintain the temperature at or near 107 F. During the treatment the patient is given as much fluid as he will take by mouth. This will vary from 1,000 to 3,000 cc. At the end of the treatment the patient is placed in bed, covered well and given additional fluid. We do not believe in a period of "cooling off," for we have found it to be unnecessary. All during the treatment, while the patient's temperature may be kept at 107 F. the environmental temperature is 6 to 10 degrees lower. This leads to more comfort on the part of the patient and more successful treatments. The patient who takes about 4,000 cc. of saline solution over the normal fluid intake seems to do best the day of treatment. The next morning the patient is discharged from the hospital, to continue with the work of his assignment.

As I have previously said, we have had at our institution 323 persons with syphilis of the central nervous system. Owing to the extensive treatment necessary and to the number of patients, we have so far been unable to give fever therapy to persons with early syphilis. We have treated only those whose syphilis was relatively advanced. These 323 are a representative group who might be found in any institution of this type. We feel that the results in our group offer a fair indication of what can be expected of this treatment in similar institutions.

Fifteen patients were unable to take treatment because of some physical disability. Twenty-four were transferred to other institutions, where they were subsequently treated. Eight died during the course of treatment of causes not directly related to the fever therapy. Autopsy reports on these patients were complete, and the pathologic report in no way laid the cause at the doorstep of hyperpyrexia. Forty-two are awaiting treatment at the present time or as yet have not completed their full course. Sixty-six of our men were released from prison without full treatment. These men completed their sentences during the early part of our fever program, and this required their release from the institution. The state hospital system was not capable of absorbing so large a number in so short a time, and, as a result, these men were returned to their communities, to follow out their treatment. Of the original 323 men, 168 have completed their treatments and have been either improved or clinically cured (table 3).

If we consider only the 168 men who have completed treatment, we find that 140 of these patients are clinically well and have negative serologic reactions. Twenty-eight have been improved clinically but still have positive reactions of the spinal fluid. Those who have remained in the institution, and whom we have been able to follow, show no tendency as yet to reactivation. All of

the patients on treatment have shown some improvement. If we consider, then, the 168 patients who have had the opportunity to complete their treatments, we can say that if a man is physically able to take fever treatment we can offer him an 83 per cent chance of remission and a 100 per cent chance of clinical and serologic improvement (table 4).

TABLE 3. — *Data on Treatment of Men with Positive Spinal Fluid.*

	Total No.	Percentage
Men with positive spinal fluid reactions	323	
Unable to receive treatment	15	4.6
Transferred	24	7.4
Expired	8	2.5
Under treatment	42	13.0
Incompleted	66	20.5
Completed treatment	168	52.0

TABLE 4. — *Data on Men Who Completed Treatment.*

	Total No.	Percentage
Completed treatment	168	
Became negative	140	83.3
Improved	28	16.7
Unimproved	0	0.0

Obviously not every man is capable of undergoing this strenuous treatment, and we have as yet no successful alternative. If, however, the condition of an inmate coming through the gate of a penal institution is relatively normal except for the syphilitic infection, then all that he needs to meet the situation successfully is wholehearted cooperation with the efforts of the medical department. We have every reason to believe that among the 42 men now being treated and waiting we can expect approximately the same 83 per cent of remissions which we were able to obtain among the first 168 men. There is nothing particularly unusual about this. Any institution using similar treatment can expect the same results.

The length of the time since infection has a bearing on the percentage of reversals. We have divided these 168 men into groups with infection of 0 to five years, five to ten years, ten to fifteen years and fifteen to twenty years. We have then attempted to see how much treatment might be necessary for remission for different durations of infection. A man with the shortest infection time can apparently expect a remission in about the same number of hours of treatment as a man with a twenty year infection, but a man with a five year infection has a 91 per cent chance of remission while one with a twenty year infection has only a 69 per cent chance (table 5).

TABLE 5. — *Results of Treatment in Comparison to Duration of Infection.*

Since Primary	Total	Neg.	Pos.	Doubt	Percentage of Neg.	Av. Fever Hrs. per Patient
0 to 5 years	68	62	5	1	91	69
5 to 10 years	49	43	4	2	88	70
10 to 15 years	26	16	6	4	61	65
15 to 20 years	25	19	5	1	76	68
Grand Total	168	140	20	8	83.3	

It is then apparent that the shorter the infection the greater chance of remission is offered to the patient. In line with this reasoning, there seems no reason why we should not be able to treat early syphilis in which the central nervous system has not become involved and offer to the patients shortened

courses of treatment, with an even better prognosis for the future. Unfortunately, the demand on the fever equipment in our institution will not allow us to treat all of the patients who could or would be benefited by this work.

In a large penal institution the syphilitic is a real problem, especially the one with dementia paralytica. He often presents an acute behavior problem. At the State Prison of Southern Michigan we have come to give men who present chronic behavior problems lumbar taps. In this way we have picked up 28 patients with syphilis of the central nervous system, all of whom had negative reactions to the Kahn blood test and consequently were missed in our routine examinations. These men were treated with fever therapy. One of the first things the inmate tells us is that he feels better, that his mind is clearer and often that he can see better. Often we are able to eradicate completely the behavior problem for the patient with the improvement of the clinical condition.

If we are not going to be able to treat the patients with early syphilis with fever equipment, certainly the public is entitled to demand that we give fever to those with the disease in an effort to keep these men from going on into typical tabetic and paretic conditions and becoming permanent state wards. The men themselves have come to look on fever as a real favor which they are offered, and a large majority ask to have the opportunity to receive fever therapy. By giving sufficient treatment we can provide a real future for the syphilitic inmate in the penal institution. At present this type of treatment in conjunction with intensive chemotherapy offers us a tangible solution in the treatment of the syphilitic patient in prison.

Summary

1. Ninety-five per cent of the inmates must be returned to the public. The problem of the medical staff is to see that these men are returned in proper physical condition, and one of the greatest parts of this problem is syphilitic infection.

2. Twelve per cent of inmates coming into the institution over a period of twenty years have had positive reactions to the Kahn blood test, and 19 per cent of these have had some involvement of the central nervous system.

3. Lumbar punctures were made on all with positive reactions to the blood Kahn test, on all with a history of syphilis and since January 1937 on all presenting behavior problems. Twenty-eight of the last showed positive reactions of the spinal fluid and had negative reactions of the blood.

4. Dementia paralytica and tabes dorsalis develop in prison in spite of intensive chemotherapy, and thus we feel that fever therapy has a definite place in the treatment of syphilis in prison.

5. With the ordinary prison staff malaria cannot be successfully handled. After 29,726 hours of artificial fever, we believe that this is the solution to the problem in prison.

6. The patient is prepared with a Schmitt treatment the night before and a hot shower in the morning. His temperature is raised to 106.4 or 107 F. in as short a time as possible and maintained for six hours with as low an environmental temperature as possible. We feel that a "cooling off" period is unnecessary. All our patients are strictly ambulatory.

7. Among the men completing treatment we have been able to obtain 100 per cent clinical and serologic improvement and 83 per cent of remissions.

8. Regardless of the length of infection, the same number of hours of fever therapy give the same results. However, patients who have had the infection for five years show 91 per cent of remissions, while those who have had the infection up to twenty years show only a 69 per cent of remissions. Thus we feel that fever therapy should be offered to patients with early syphilis if the equipment is adequate.

Conclusion

We feel that hyperpyrexia by the method we employ is the most successful means of handling syphilis of the central nervous system in prison today, and we feel that its scope should be widened to include patients with early syphilis if an adequate staff and equipment are available.

Discussion

Dr. Kenneth Phillips (Miami, Fla.): If this report did not contribute anything else it surely has demonstrated to all practitioners of physical medicine, that valuable clinical research can be developed by those who do not have extensive equipment and highly trained assistants.

The report, however, contributes more. It reemphasizes the facts that fever therapy, when it can be used, reigns supreme in the treatment of syphilis and that conventional chemotherapy alone is unsatisfactory. The rank and file of medical practitioners are pitifully slow in recognizing this fact. In our clinic we have administered over 20,000 treatments in the past ten years without a casualty. I agree with the essayist and have always preferred the short induction period, protein-glucose-chloride administration prior to treatment, and the low cabinet temperature. However, our experience differs in that as time goes on we become more discouraged and puzzled regarding the low percentage of reversals in serology in proportion to the number of apparent clinical remissions and cures. Utilizing quantitative studies we find that the units decrease often to zero, but the qualitative positive reaction still remains in a high percentage.

What is the clinical significance of a low titre positive serology following an adequate coures of chemo-fever therapy?

Dr. Henry Gwynn (Washington, D. C.): Until I heard this paper, I should have thought, too, there was a certain economic advantage to malaria therapy in such a group of patients as described by the essayist. From a purely medical point of view, I think it is difficult to say whether malaria therapy is an advantage over other types of fever therapy. There is debate on this point. Certainly, in my own personal opinion, the chief advantage of artificial fever therapy over malaria therapy is because we are able to use chemotherapy in connection with it and because we have such fine control of temperature levels. For that reason I feel that the patient's safety is guarded.

I agree with Dr. Phillips that one of the most important things in the paper is showing that artificial fever therapy can be safely administered when certain facilities are lacking.

Dr. Robert F. Dow (Paterson, N. J.): The essayist agrees with those who offer hyperpyrexia as a prophylactic measure against complications of the central nervous system in syphilis; it is a compelling vision, with possibly a radical effect on the psychiatric problems of the nation, and on the maintenance of maximum manpower of our armed forces.

It will be recalled that nearly seven and one-half million days were lost by our fighting men in the first World War because of social diseases.

The prospects now may be for ridding the overburdened mental institutions of the load of patients with dementia paralytica who form an appreciable percentage of the census of such retreats everywhere. In this respect, I wish to emphasize that the essayist's data show that an amazing ninety-one per cent chance of remission is offered to the patient who submits to hyperpyrexia in the first five years of syphilitic infection. The importance of this fact cannot be overemphasized, since it has been estimated that syphilitics constitute about one-tenth of the census of mental institutions. This is a tremendous burden on the taxpayer, besides the economic loss entailed in paralysis, cardiac disease, etc., the entire annual cost having been placed by Hazen at ten trillion dollars.

The remission rate, obtained in this series of 168 cases in which therapy was completed, is considerably greater than the average of rates reported previously by many investigators. It may be especially significant, therefore, that these patients have been submitted to a greater "degree-hour" of treatment than has been noted generally in earlier papers. The range of temperature maintenance mentioned by Dr. Huntley is 106.4 to 107 F., a differential of merely 0.6 F., but one that may be critical because it is so near the level of therapeutic tolerance; in my opinion, the hazard is excessively increased thereby. Moreover, in another recent series of 320 cases presented by O'Leary and his associates it was found that the percentages of clinical remission in a group who had received fever treatment at temperatures of 106 F. to 106.4 F., were similar to those obtained in a group treated at the more hazardous level of 106.5 to 106.9 F. Therefore, there seems no clinical advantage in maintaining the temperature higher than 106.4 F., but there may be a distinct favorable effect in administering the fever for the entire maintenance period at one plateau, the maximum temperature, instead of the multiple level previously employed.

The lack of morbidity directly attributable to the administration of hyperpyrexia in the large series reported attests to the strict detail of his approved technic, and the relatively greater safety and comfort obtained with this method of producing artificial fever.

Dr. H. Worley Kendell (Dayton): The question is whether fever combined with chemotherapy is more effective than fever therapy alone.

There seems to be very little doubt that fever therapy combined with chemotherapy

offers more than either agent alone. The intramuscular preparation, usually some form of bismuth, is administered immediately before the treatment session begins and the intravenous arsenical is administered at the time the patient's temperature reaches the desired level. In the treatment of early syphilis with fever combined with chemotherapy, it appears that artificial fever intensifies the curative action of the chemotherapeutic agents. In our experience, with combined treatment, during the past ten years, we have noted that artificial fever in some way suppresses arsenic sensitiveness, which factor has permitted us to use the chemotherapeutic agents for patients in whom such drugs alone produced unfavorable reactions. The exact phenomenon is not known but we feel that such combined treatment can be recommended without noticeable fear of direct reaction.

Dr. Janet Travell (New York): I should like to ask, Dr. Huntley, if he has any data as to whether chemotherapy enhances the effectiveness of fever therapy.

Dr. Milton G. Schmitt (Chicago): I should like to say in relation to the hydrating solution mentioned by Dr. Huntley, he has helped me in one regard, that is, in private practice we find that patients frequently exercise their objection to doing something because they just do not want to do it. In his institution patients are decidedly more cooperative and when they are told what to do they just do it. He has found no objection or refusal to the use of this hydrating solution as has been encountered in some of our private patients. The chief objection to the hydrating solution might be the care with which it needs to be prepared. I have described this in the literature, but, because of lack of space I was not able to add this word of caution. The solution contains gelatin. If it is prepared over an open flame, whether originally made that way or the serving portion is reheated that way, the gelatin may become scorched, which causes it to have a burnt animal flesh odor which is nauseating and distasteful. If the solution is made or later reheated in a steam bath or double boiler there is no scorching of the gelatin, and there is no characteristic odor except that of a soup stock that might be used in preparing it.

Dr. William Bierman (New York, N. Y.): We were all interested in hearing Dr. Huntley's results with a group of patients whom he could observe so definitely. What amazed me somewhat was the fact that he could elevate the temperature in his patients to a level of about 107 F. and have that technic in the hands of, as I understand it, relatively unskilled persons. From our own observations of such temperatures, I would make the very definite pronouncement that I would not advise any of you to go ahead and try it. I have the suspicion that Dr. Huntley has given some careful instructions to his technicians. If you have had any experience in seeing patients whose temperatures were maintained at 107 F. for six hours, I think you would join with me in expressing some trepidation concerning a technic in which patients are not continuously observed by a person who has at least a nursing background and preferably who has had additional training. I should very much like to find out from Dr. Huntley whether these technicians have been trained by him or whether they are untrained persons who are simply instructed to go ahead and watch the instrument, which I suppose indicates the rectal temperature, and told to turn one lever or another when that temperature reaches 107 F.

Dr. W. B. Huntley (closing): As to the use of chemotherapy along with the fever, I have never used fever therapy alone. In prison, if a routine is established, it is best not to change the routine. I have spent many hours to train assistants to give the treatment. At the present time, the work seems to be as foolproof as is possible. The temperature was raised as high as 108.4 F. and the patient is still living and in good health. Another question comes up as to the significance of a positive test after sufficient treatment. A patient, a life prisoner, who entered the prison in 1928 was treated with chemotherapy and was ruled out as Wassermann-fast. The blood count was positive. He was treated with chemotherapy and was told that he was Wassermann-fast. In 1937 the blood count and the spinal count were positive; and there was a colloidal gold curve. This patient was given 20 treatments of one hundred hours, and about eleven months later, the Wassermann and Kahn tests were positive with much reduced colloidal gold. He was given seventy-five hours more fever and was still in a positive group. In 1939 another test showed a negative reaction to the Kahn blood test and yet the patient was ruled out as Wassermann-fast. In 1940, the blood showed a negative reaction, a doubtful spinal Kahn reaction, but a little increase in the colloidal gold. The patient was then given twenty-five hours at 107 F. In 1941, the blood and the spinal fluid of this patient showed a negative reaction to the Kahn test and a negative colloidal gold.

MASSAGE IN INTERNAL MEDICINE *

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The World War of 1914-1918 produced a need for treatment other than surgical for the countless casualties and gave a great impetus to the art of massage, not only in the United States, but throughout the world. The present war is bound to effect another meteoric rise in the prominence massage will play in the rehabilitation of the thousands of casualties. Therefore, it is an opportune time for an adequate review of one of the oldest forms of treatment known.

History of Massage

The history of massage parallels that of humanity. The Chinese used massage for the relief of the aches and pains of rheumatism almost 6,000 years before the discovery of acetylsalicylic acid (aspirin). The use of massage is easily traced back to the time of Hwang-Ti, in 2697 B. C., and Cantlie[1] has traced it back twelve centuries previous to that era. The simple forms of massage were known 6,000 years ago, and tapping, kneading, pommeling and pinching were used routinely. The Japanese and South Sea Islanders adopted the practice from the Chinese. Egyptians, Hindus, Turks and Persians have employed massage from the beginning of their history. Homer's Odyssey is indirectly a living memorial and testament to the art, as the glowing words describe how the heroes of Troy were prepared for battle and were refreshed by massaging and anointing with oil.

All classes made use of massage in both ancient Greece and Rome. The purpose of its administration was not always the same. To the rich, it was a luxury in conjunction with the baths and to the poor, it was a means of hastening convalescence. To the traveler and gladiator, it was a conditioner to insure against travel and hardship. In Greece, it was considered such an honor to be allowed use of the baths and the gymnasium that only freeborn citizens were permitted the privilege and a law made death the punishment for any slave caught using the facilities of the gymnasium. Those who administered the massage were usually the priests or the medical practitioners, but many wealthy persons trained their own slaves in the art. Socrates, Pliny and Hippocrates all praised massage highly. Cicero, Caesar, Celsus, Hadrian and other famous Romans attributed much of their good health to the men who administered their massage. Galen (130-200 A. D.), as the first team physician, athletic director and trainer to the gladiatorial school at Pergamus, insisted that his athletes have a "warm up" period of massage before they entered the arena, and he warned that to indulge in athletics without first softening the body was to invite sprains or serious bruises.

Ambroise Paré (1517-1590) described gentle, medium and vigorous massage and the effect of each type. The art of massage flourished in France more than 200 years ago and became known extensively throughout all of Europe. Massage had its period of prominence and its years of abandonment, but with the advent of the Royal Central Institution in Stockholm under the direction of Peter Henry Ling (1766-1839), the modern concept of massage came into being. The methods that Ling introduced were not new, although he tried to improve on those in use at that time. His methods were those of the Egyptian priests and the Brahmins

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of India; all the movements he described are recorded in the ancient book of the Chinese called the "Kong-Fu." Ling attempted to place massage on a scientific basis.

Douglas Graham[2] of Boston was one of the pioneer American authorities and the introduction of massage into the sick room in 1877 by S. Weir Mitchell did much to increase the favor of therapeutic massage.

The first twenty-five years of the last half century were devoted mainly to diagnosis and were dominated by the teachings of Osler. The twenty-five years just passed have seen the trend swing to the stress on therapeutics. Massage gained prominence and today is steadily growing in recognition as a worthy remedy long neglected.

The Art of Massage

Massage is a medical art, founded on anatomic and physiologic knowledge, developed by clinical experience and observation and aided by personal skill and practical application.[3] To this may be added that massage consists of certain manipulations or procedures, best performed with the hands, carried out on the surfaces of the body with an exact dosage in local, temporal and dynamic respects.

Many practitioners of medicine often hold the belief that massage is either a mysterious black art, difficult to acquire, or else it is the tool of charlatans. To many, massage means merely rubbing. Even those who prescribe massage may be ignorant of its uses and the indications for its employment. Therefore, those ignorant of its use are prescribing a therapeutic agent in a haphazard way much the same as one would prescribe an unknown drug, with no regard for the consequences. More harm can be done through careless or ill-advised utilization of massage than by any other physical means. Pemberton[4] stated that there was probably no other measure of equal value in the entire armamentarium of medicine so inadequately understood and utilized by the medical profession. However, no one will deny its curative powers when applied by the hands of a well-trained physical therapy technician under proper medical supervision.

Who shall administer the massage, physician or technician? At first, the most plausible answer is that the physician, with his superior knowledge of the anatomic, physiologic and pathologic structures, should be the one to administer the massage. However, massage requires time, and there is no question but that the trained technician is qualified to carry out the orders of the physician, provided a definite prescription is written for each patient. Explicit directions should be given to the technician in regard to the diagnosis, symptoms and site of the illness, the duration of treatment and the frequency and type of massage necessary. What is most important, the physician should supervise the treatments from day to day and vary the prescription according to the progress made by the patient. When the patient is referred to the technician, the physician is still responsible for the care of that patient.

How Massage Produces Its Effects

Through the use of massage, physiologic effects are produced by reflex action, mechanical stimulation, or a combination of both.

Reflex Action of Massage. — Some authors deny that there can be any reflex action of massage and admit only the mechanical action. However, the reflex action is just as important as the mechanical action. Mennell[5] and others often have stated that the patient who has a fractured bone suffers much pain from muscular spasm. Under the influence of light stroking combined with proper support for the part, the tension of the muscles will disappear and the pain will be alleviated. Deformity cannot be reduced by the light stroking massage, but the spasm can be relieved. In such cases, the effects cannot be said to be due to mechanical action, as the pressure of the stroking may be so light

that the circulation cannot be stimulated mechanically. Moreover, the effect is the same regardless of whether the direction of the massage is centripetal or centrifugal.

Light, sedative massage may accomplish more than barbiturates in affording rest and relaxation to certain neurasthenic patients. Massage heavy enough to produce a mechanical type of action in these patients often will aggravate the condition and may even produce deleterious results. Facial neuralgia and headache frequently respond in a remarkable manner to light, smooth stroking which barely touches the surface of the skin.

In Abdominal Massage: Many schools have taught that massage of the abdomen, to be effective, must be accomplished by use of heavy movements and the mechanical effect of the massage is stressed. It is believed that fecal masses may be broken up by such mechanical action. However, intestinal contents are liquid until they reach the colon, where the absorption of fluid takes place. If any masses can be palpated through the abdominal wall, they should be considered a contraindication to massage until their exact nature can be determined. An enema will remove all impacted fecal masses in nine cases out of ten. Any mass firm enough to be felt through the abdominal musculature may be hard enough to produce trauma to the wall of the bowel and may even cause perforation. Distinction also should be made between an atonic or hypertonic state of the bowel. The treatment differs widely in these two conditions.

Massage does not need to be directly over the abdomen to produce a reflex action on various parts of the intestines. Mennell[5] stated that stimulation of the skin around the spinous process of the fifth thoracic vertebra has been observed to cause relaxation of the pyloric sphincter, whereas similar stimulation around the seventh cervical spinous process has just the opposite effect. Mild stimulation of the skin over the abdomen can be shown to originate peristaltic movement in the stomach.

On the Heart: Reflex stimulation of the heart has been claimed. Tapotement over the thoracic wall is said to retard the cardiac rate; this effect is presumably attributable to stimulation of the vagus. However, this claim cannot be proved definitely. Conversely, stimulation around the third and fourth thoracic vertebrae has been said to effect an acceleration of cardiac rate.

Mechanical Action of Massage. — Heavier pressure over a part is required to obtain a mechanical action than is necessary if only reflex action is desired. A mechanical effect can be produced in four ways: (1) by assisting circulation in the venous system; (2) by aiding the movement of the lymph; (3) by tension on some structure it is hoped will be freed or stretched, and (4) by the effect of pressure on the abdominal viscera.

Massage for the mechanical effect alone is impossible. Massage applied for mechanical effect always stimulates some reflex response as well. However, the reflex response may be secured by light surface stroking without the production of any mechanical effect.

On Circulation of Blood: In producing a mechanical effect on circulation, massage acts in two ways, namely (1) it assists in the venous return by mechanically forcing the blood upward into the larger vessels and (2) it acts on the walls of the arterioles in such a way that it causes a reflex dilatation and then causes contraction of these unstriped muscular fibers, thus maintaining the tone of the fibers and of the vessels themselves. The pressure in the veins is only 5 to 10 mm. of mercury in the deeper vessels. Consequently, it is not necessary to expend a great deal of strength or effort to assist in venous return.

On Circulation of Lymph: Everything pertaining to the effect on the venous circulation applies also to circulation of lymph. The assistance rendered to the venous channels likewise reduces the tendency to stagnation of the lymph

and, in turn, formation of edema. Pressure in the lymphatic vessels is lower than that in the veins; therefore, little force is necessary to affect them.

Lymph does not clot in the same manner as blood, but it does assume the consistency of molasses if the edema is of long duration. Therefore, it is necessary to exert more pressure in cases of edema of long duration than would be required if the edema had occurred recently.

In Stretching Tissues: All tissues of the body are elastic to some extent, with the possible exception of bone. A slow, steady traction, followed by slow relaxation, will serve to stretch tissue much in the manner of a spring. However, the use of too much force may produce a reaction so severe that it will necessitate postponement of the treatment for some time. The part of the body so affected will then have to be put at rest, with the end result that impairment of function may be as bad, if not worse, than before. Any forcible stretching or tearing of tissues should always be performed by the surgeon while the patient is under anesthesia.

On the Abdominal Viscera: Peristalsis often can be seen or felt through the abdominal wall of thin persons. However, the only portions of the bowel which are in fixed relationship to the abdominal wall are the duodenum and the ascending and descending portions of the colon. As the exact location of the transverse colon is uncertain, it is necessary to be cautious about claims relating to the ability to stimulate directly any particular portion of the intestinal tract.

Probably one of the most useful actions of massage is in assisting the flow of fluid along the course of the colon during the administration of colonic lavage. Slow, firm stroking in the direction of the cecum will enable the patient to retain more of the lavage with much less pain or discomfort. Patients who normally retain only 1 pint (500 cc.) of fluid may retain as much as 4 pints (2000 cc.) if massage is employed.

On Various Organs: The effect of massage over the heart has been demonstrated to be owing to a reflex and not to a mechanical action. Prostatic massage is entirely for the mechanical effect of emptying the ducts of debris. There has been much controversy about the value of massage to stimulate the secretion of glands that produce various digestive juices, but the consensus is that mechanical stimulation cannot be compared to chemical stimulation in the production of active digestive juices. The effect of massage over the pancreas and spleen is problematic, as it is over the liver and gallbladder.

Physiologic Effects of Massage

Massage was administered for centuries without thought of the physiologic basis underlying its use. The beginning of the physiologic explanation resulted from Harvey's theories on the circulation of the blood. A knowledge of the physiology involved is important for the physician who prescribes massage because the indications and contraindications to massage are based on physiology. Otherwise, anatomic or pathologic knowledge or skill in applying massage will be valueless.

Metabolism. — Pemberton[4] expressed the belief that massage has no immediate or great effect on the general metabolism. According to Cuthbertson,[6] there are few, if any, demonstrable changes in metabolism. It has been fairly well established that abdominal massage will produce an immediate increase in the output of urine. However, this is seldom true diuresis, but merely a temporary increase in the urinary excretion. The increase is almost immediate and is associated with an increase in the excretion of nitrogen. This may be independent of abdominal massage and pressure and may result from massage administered to any region. If the output of urine is examined over a twenty-four hour period following massage, it is found that there is little if any change in volume or content of nitrogen from a specimen taken twenty-four hours before massage.

After the initial increase in output, there is usually a compensatory decrease. The specific gravity also remains fairly constant.

Leber and Stüve[7] reported an increase of 10 to 15 per cent in the consumption of oxygen and a corresponding increase in the production of carbon dioxide. Cuthbertson,[6] however, stated that massage has no effect on the consumption of oxygen, nor was he able to detect any effect on the blood pressure or pulse rate.

Blood. — Massage, especially if it is vigorous, manifests some of the characteristics of mild exercise, and therefore, might be expected to produce some of the changes in the blood like those produced by mild exercise. Active contraction of muscles results in the formation of lactic acid, and this acid may be present in sufficient quantity to cause a change in the hydrogen ion concentration of the blood toward acidosis. However, even after rather vigorous massage it is not possible to demonstrate an increase in catabolic products. In some cases, a slight decrease in alkalinity has been revealed, but not to the extent that would occur after even mild active exercise.

After massage, there is an increase in the number of erythrocytes, regardless of whether the patient may be healthy or anemic. In anemia, the greatest increase usually is found an hour after massage, after which the number of erythrocytes slowly returns to its former level. Pemberton[4] stated that an increase in the erythrocytes and hemoglobin of the circulating blood is beyond question.

Even light massage produces marked vasodilatation which can be prolonged by the deeper and heavier forms of massage. Carrier[8] has demonstrated that light pressure is enough to produce an almost instantaneous, although momentary, dilatation of the capillaries, whereas heavy pressure will produce more prolonged vasodilatation.

The increased power of absorption following massage has been ably demonstrated many times in the following experiment. India ink is injected into the knees of rabbits. One knee is massaged; the other is untouched and acts as a control. Almost all of the ink will have been absorbed in the leg which has been massaged, and the intermuscular connective tissue and lymph nodes above the joint will be stained deeply. In the control limb there is little absorption. The rapidity of absorption of any substance is increased greatly in any organ or tissue which can be subjected to massage. This absorption takes place through the lymphatic system and the lymph nodes.

Skin. — After removal of a cast from a limb or a part, massage is of value in removing the detritus and excessive secretions and in cleaning the orifices of the sebaceous and sweat glands. The minute amounts of histamine liberated during massage cause a vasodilatation which, together with the mechanical effect, is enough to increase the temperature of the skin from 2 to 3 degrees C. Rosenthal[9] found that the rise in the temperature of the skin of neurasthenic persons was higher than that of normal persons, and that women showed a greater rise than men. This may be explained on the basis that the vasomotor nerves are more easily stimulated in the neurasthenic than in the normal individual.

Muscles. — Properly administered, massage will do more toward relieving the fatigue of an overworked muscle than rest or any other single factor. The explanation probably lies in the increased rate of absorption of waste products of metabolism.

Several workers have demonstrated that massage is a useful prophylactic against muscular atrophy. Frequent massages are recommended for those who have anterior poliomyelitis in order to improve the nutrition and the tone of the muscles and to prevent atrophy as much as possible. When involvement of nerves is extensive, either from disease or trauma, massage cannot be expected to accomplish the impossible.

Massage may be used in many cases to take the place of mild exercises. Massage will never increase muscular strength, but in the presence of cardiac decompensation the patient will profit by its use, and will gain thereby some of the physiologic effects of light exercise which his physical condition forbids. Too much or an improper type of massage may defeat the purpose, however, by promoting too great and too rapid absorption of toxins, and thus the patient may be overwhelmed with the toxins at a time when he is unable to cope with them. This condition, which usually occurs among elderly and enfeebled patients, may be accompanied by fever.

Nervous System. — Here the effect depends on the strength and duration of the stimulus. Mennell[5] describes the slow, gentle and rhythmic massage administered to neurasthenic or insomniac patients, and he relates how such patients gradually will be lulled to sleep. This demonstrates the reflex action and its effect on the local and central nervous systems.

Rosenthal[9] found that the threshold of stimulus was raised appreciably after massage, but that the sharpness of the sense was impaired for about ten minutes. Massage over a nerve may at first cause pain, but if the stimulus is continued the pain gives way to numbness and relief. This principle may be adapted for use especially in patients in whom the nerve lies on or close to the bone, such as the ulnar nerve at the elbow. Massage may therefore be used in the treatment of neuralgia when such a nerve is available.

Technic of Massage

A physician should have a general knowledge of the physiologic effects of massage, just as he knows the effects of the drug he prescribes. He should know what kind of massage to prescribe and the dosage. The latter is important and should never be omitted. Local regions should receive from ten to twenty minutes of massage daily. Thirty to forty-five minutes should be devoted to the administration of a general massage.

Superficial Effleurage. — Superficial effleurage is accomplished by passing the hand slowly and rhythmically over a region of the body. The object is solely to produce a reflex effect. Therefore, the touch should be light as well as slow and rhythmic. The direction of the stroking is unimportant but should always be the same. Movements should be slow; it should take from four to five seconds to complete each stroke, and the interval between strokes should be of the same duration as the stroke itself. Thus, the tempo is maintained at all times throughout the cycle. There should be no shock of contact at the beginning nor any jarring at the end of the stroke. The hand should be kept in contact with the skin and adapt itself to the contour of the part. This form of massage seems extremely simple, but it is difficult to master. The most common errors made during the administration of superficial effleurage consist of (1) breaking the rhythm, (2) changing the direction of the strokes and (3) scratching the skin with the finger tips at the beginning or end of the stroke, a fault common to beginners. Stroking against the direction of the natural growth of hair often is unpleasant and should be avoided.

Deep Effleurage. — This type of massage produces a direct effect on the circulation by mechanical action on the veins and lymphatics. Deep effleurage to a part should always be preceded by superficial stroking. The pressure should be increased gradually until it is sufficient to empty the veins and lymph vessels mechanically.

The patient should be well relaxed and recumbent. This permits the technician to take advantage of gravity and is especially important in the presence of edema. The hands of the operator should be relaxed and conform to the contour of the part being treated. It is not necessary to exert any great strength or

force. Heavy or irregular movements may cause a reflex contraction of the muscles.

In the massage of an extremity it will be impossible to improve circulation low in a limb if the circulation is blocked higher up. In treating a leg, therefore, the massage should begin from the knee to the hip and from the ankle to the knee.

The rate of stroking should be slow, steady and rhythmic, with the pressure always in the direction of venous flow. The hands should remain in contact with the patient on the return stroke, which should be much lighter than the initial, deep stroke but without any change in the tempo between the two.

Pétrissage. — The object in pétrissage is to assist the venous and lymph circulation, to aid in the removal of metabolic debris from muscles and to stretch retracted muscles and tendons. Complete relaxation of the patient is important. Pétrissage consists of wringing, grasping, rolling or compression of a muscle or group of muscles. When the muscles are fairly bulky, each muscle may be picked up separately and pressed or rolled. After each successive movement, the technician's hands are moved along the hand's breadth and the process is repeated, rhythmically. The procedure should never be so strenuous as to produce a protective spasm of the muscles. Pétrissage should always be preceded and followed by effleurage.

Friction. — The term "friction," as used in massage, is somewhat misleading. It consists essentially of exerting deep pressure on the part, usually with the ball of the thumb, fingers or sometimes the heel of the hand. The hand or finger should remain in contact with the skin and the motion should be in small circles. No lubricant should be used. Friction is particularly useful over small parts, such as the hands or face, and will aid in stretching scar tissue and adhesions and assist in freeing adherent skin and promoting absorption of localized effusions. These movements also should be preceded and followed by effleurage.

Tapotement. — This form of massage is of slight value. It is the massage of the gymnast and generally is used only for vigorous persons. Mechanical stimulation of the arterioles causes them to contract, which, in turn, causes blanching of the skin. This blanching usually is followed in a short time by vasodilatation attributable to paralysis from overstimulation. This is much too strenuous for therapeutic use and much better effect can be obtained by simpler methods.

Hacking: Hacking is the most commonly used form of tapotement. It is administered by striking the part treated with the ulnar surface of the fifth finger, the other fingers striking each other in rapid succession. The movement is entirely from the wrist and each hand should strike the patient alternately.

Cupping: Cupping is similar to hacking, except that the cupped, palmar surfaces of the hands are used. The movement also is entirely from the wrists.

Tapping: Tapping is applied by striking the surface of the part with the tips of the fingers, using each hand alternately.

Slapping: Slapping is a percussion movement in which the hands are kept flattened and the palmar surfaces strike the part in alternate succession. It is usually more vigorous than clapping.

Beating: Beating is the most severe form and is done with the half-clenched fist, so that the knuckles or sometimes the heel of the hand makes the contact with the part. It is usually applied to very healthy persons and then only to the back, buttock or larger muscles.

Vibration: This is a difficult form of massage to apply properly and is most tiring to the operator. It is applied through the operator's fingers or hand by a continuous and rapid trembling motion of the operator's shoulders and forearms. If vibratory massage is necessary, various mechanical devices may be used to produce this effect. It is claimed that vibratory massage produces

a "general tonic effect" when applied to the spinal column and also that it has an inhibitory effect on the peripheral nerves.

Mechanical Apparatus for Massage and Exercise. — The most frequently employed and probably the most useful of all apparatus for mechanical massage is a small vibratory apparatus which may be attached to the hand of the operator. Its field of usefulness is limited strictly to the application of vibratory massage. Almost all other devices have proved to be of little value or even harmful.

In 1857, Zander brought the use of mechanical devices into prominence and many hospitals, even in this country, were equipped with Zander rooms fitted with his mechanical devices. His devices differed little from those in use today, and were able to produce all the effects that any modern mechanical device can. However, these Zander rooms eventually fell into disrepute.

Charlatans of the present day have run the gamut of imagination in producing mechanical massagers and exercisers. Applicators vary from small, soft rubber buttons to large, complicated, electrically-driven rolling machines claimed to produce a contour from an amorphous mass of muscle. One rather strenuous device consists of an electric drill fitted with a hard rubber knob which can be made to vibrate at 14,000 percussions per minute over a fibrositic nodule. Theoretically, this would be an ideal way of treating fibrositis, but it remains to be proved that this method is better than the simple, vigorous manual massage now used in the treatment of fibrositic conditions.

Pemberton, Coulter and Mock,[10] acting for the Council on Physical Therapy of the American Medical Association, explored the uses of mechanical devices thoroughly. Their reports are discouraging to those who place too much confidence in mechanical measures for massage and exercise. They condemn mechanical apparatus for many reasons. Volitional effort is not encouraged because the patient becomes dependent on the machine as the only factor in the cure. In almost every instance the same results could be accomplished without the apparatus. Machines usually treat only one part of the body, afford none of the advantages of general exercise, tend to make the treatment monotonous and the patient soon loses interest. The effect of most mechanical exercisers is that of a vibratory or a shaking massage and does not produce the beneficial effects of simple, active exercise. Finally, such apparatus may be definitely dangerous, as there are on record a number of severe injuries caused by their use, such as hernias, ruptured appendix and gallbladder and ruptured duodenal ulcer. Most mechanical apparatus should not be condoned but condemned.

There is one simple device, however, which is of unquestionable value. No fantastic claims are made regarding its powers, but all should come to know and utilize the aid of the whirlpool bath. A whirlpool bath consists of immersing the part to be treated in a suitable tank filled with water, beneath the surface of which a stream of water is delivered under pressure and mixed with air by hydrostatic pressure or by an electric mixer. The indications for the use of whirlpool baths are numerous. They have all the advantages of any hydrotherapeutic measure, coupled with the circulatory increase commonly associated with immersion of a part in warm water and the gentle massaging action of the water pressure and bubbles of air against the part being treated. It is particularly useful in the treatment of painful stumps following amputations, as well as in treatment of painful and adherent scars, pustulent wounds, indolent ulcers and inflammation of tendons, joints and muscles of the extremities.

Certain Conditions in Which Massage Is Indicated

Fractures and other injuries are conditions which require special care or technic. Light stroking may relieve pain and spasm in cases of fractures, while

a heavy massage may increase the pain and muscular spasm and result in dislocation of the fragments. Bailey[11] recommended that, if splinting permits, effleurage should be begun above and below the site of injury on the second or third day. Pétrissage may be begun after the first week. Friction over or around the sites of fracture may promote an excessive formation of callus which may interfere with motion if it occurs in the neighborhood of a joint.

Deep, heavy friction seems to be one of the best therapeutic measures in the treatment of fibrositis. Nearly all persons have this condition to a greater or less extent, and heretofore all medicines and other therapeutic agents have proved valueless. Pressure and friction over those hard indurations tend to break them down and promote absorption of waste products.

Massage proves a blessing to those who have arthritis and backache. Without the aid of massage, relief of pain and restoration of movement would not be possible in many patients. In the chronic stages, deep pétrissage will aid in the absorption of waste products and should be followed by long, strong, passive movements to promote mobility.

In conditions which affect the nervous system, the diseases which affect the lower motor neurons and cause wasting of muscle usually are the conditions which will respond well to massage. Light effleurage is particularly soothing in cases of peripheral neuritis.

There is hardly a condition which affects the muscles, nerves or skeletal structure of the body which will not be influenced favorably by the proper type of massage. However, it must be remembered, as Behrend[12] has said, that there is no such thing as a special surgical, orthopedic, medical, neurologic or vascular massage.

Contraindications

The contraindications to massage usually are governed by the physiology of the part. Massage is contraindicated (1) in pathologic conditions such as neoplasms, in which the disease may be spread by massage over the involved regions; (2) in acute abnormal conditions of the skin, such as burns or extensive dermatitis; (3) if the temperature is more than 100 F. (38 C.); in these conditions, massage may not necessarily be contraindicated but careful consideration is required before proceeding with it; (4) in acute vascular disease, such as phlebitis and lymphangitis; (5) in persistent hypertension, or advanced atheroma of blood vessels or both; (6) over tuberculous lesions; (7) in the presence of a tendency of the patient to become entirely dependent on the treatment; (8) in acute inflammatory processes; (9) in acute febrile diseases; (10) for osteomyelitis without drainage, and (11) for large hernias.

Billings and Collins[13] mentioned several psychiatric conditions which require that massage be omitted. Among these are homosexuality, either latent or overt; tense and agitated depressions; paranoid reactions and hysterical personalities.

Abdominal massage is contraindicated in many conditions, or, if not contraindicated, requires careful consideration before administration. Among these conditions are malignant or benign tumors, gallstones, cysts or hernias; conditions which are likely to produce hemorrhage as gastric or duodenal ulcers or aneurysm; acute inflammatory conditions such as peritonitis, abscesses or parametritis; pregnancy or menstruation and pyelitis or renal calculi.

Comment

A study of the indications, contraindications and effects of massage, followed by its rational application, will soon repay the physician amply for his investigation. The injuries which may soon be commonplace as a result of the war will demand that every physician must use massage. He owes it to the patient to employ every means at his command to restore the injured parts to normal and massage is one of the best therapeutic methods for this purpose.

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Discussion of Paper by Drs. Walter M. Solomon and Joseph L. Morton, "Periarthritis of the Shoulder" *

Dr. Frank M. Hand (Washington, D. C.): After hearing the presentation of Dr. Solomon and Dr. Morton, I am convinced that there is not much choice between roentgen rays and diathermy for the treatment of periarticular arthritis of the shoulder. I have always felt that the use of diathermy was a little more effectual than the use of roentgen rays, but this was perhaps due to the fact that I have diathermy in my office and use it frequently.

It occurs to me that the patient benefits more from either kind of treatment if some gentle passive movements are given immediately following such physical agents and these movements increased with the addition of active movements as tolerated.

Many of these patients give a definite history of subacromial and subdeltoid bursitis in the beginning, which has or has not been adequately treated. In this type of case I have found that injecting novocain directly into the bursal sac as well as the periarticular soft tissues allows manipulation at the time and in conjunction with roentgen ray or diathermy facilitates and hastens recovery. In patients in whom we feel that fibrous adhesions are mostly responsible for the limitation of motion, and there are no signs of existent periarticular reaction, forceful manipulation of the joint under anesthesia is indicated, to be followed by physical therapy at the proper time. I therefore feel that a combination of treatments would be more efficient.

Dr. B. S. Troedsson (New York, N. Y.): In my opinion it would be of help to all of us who diagnose and treat conditions of the shoulder if we could agree on a more uniform nomenclature. Dr. Solomon and Dr. Morton have mentioned the terms periarthritis, subdeltoid or subacromial bursitis, periarthritis calcarea, calcification of supraspinatus tendon and Duplay's disease as terms used to describe the condition which they have investigated. The term "periarthritis" in my mind is synonymous with "frozen shoulder." Codman believes this condition is due to a tendinitis of the rotation muscles. Bosworth uses the term "obliterative subacromial bursitis (frozen shoulder)" and reports a lesion massively obliterated by dense adhesions, ordinarily unusually dense about the subscapularis tendon. The term "periarticular fibrositis" is to me the proper term to use as it does not appear to be an arthritis of either the atrophic or hypertrophic type. The term "periarthritis calcarea" I would discard altogether as being too inclusive and

* This article appeared in the October, 1941, issue of the ARCHIVES.

too undifferentiating. Calcification of the supraspinatus tendon which is also called peritendinitis calcarea of the supraspinatus tendon is a specific diagnosis. This condition may be present alone, with or without calcification in the bursal wall or in the bursa, with or without causing symptoms, and with or without an associated subacromial bursitis. Duplay, a French surgeon, originally described subacromial or subdeltoid bursitis. In its simplest form, it consists of an outpouring of fluid into the bursa without any other structures being involved, an acute or chronic subacromial bursitis. In many cases it is associated with the calcium deposits just mentioned and it then should be called either acute or chronic subdeltoid bursitis with calcium deposit. I believe the cases presented by Dr. Solomon and Dr. Morton fall into these last two groups, acute or chronic bursitis and acute or chronic bursitis with calcium deposits.

To evaluate the comparative merits of the various forms of treatment requires, in my opinion, that we classify the patients into these four groups: (1) acute bursitis without calcium deposits present, (2) chronic bursitis without calcium deposits present, (3) acute bursitis with calcium deposits present and (4) chronic bursitis with calcium deposit present.

In the first group the symptoms disappear readily with proper management, such as surgical, medical or physical therapeutic, provided the cause is also removed. In the second group adhesions have formed. To stretch these to the point where they do not interfere with function requires time. The treatment should include massage and exercises and may even require surgical procedures. Roentgen ray treatments may be of some value. In the third and fourth groups it is important in my opinion to determine the size and the location of the calcium deposit. It may or it may not be the cause of the symptoms. If the deposit is the cause or the result of the disability then residual symptoms will persist until the deposit has been removed. If of long duration, chronic adhesions and contractures will also have formed and will have to be treated. If the disability is not related to the deposit then the symptoms disappear readily under proper management. I think each group represents a separate problem requiring separate management. Drs. Solomon and Morton have treated them as one unit and with one modality only—either short wave diathermy or roentgen therapy. On a pathologic, physiologic and clinical basis, I would expect their results to be identical, and I think it is interesting to see how identical they are. The results show, I think, that short wave diathermy and roentgen ray treatments alone are insufficient. The statistics presented can, however, form a basis for other comparative studies, and we are indebted to Dr. Solomon and Dr. Morton for having presented them to us.

Dr. Darrell C. Crain (Washington, D. C.): Dr. Solomon has cleared up a point about which I am sure many of us have wondered, that is the relative value of these two forms of therapy. Having seen some patients who responded to each type of treatment and others who resisted both types, one sometimes wonders which form to recommend.

During the past three years I have had occasion to observe four patients with periarthritis of the shoulder which was of a rather unusual nature. All four patients were elderly and all had followed a debilitating experience; for example, one had had a stroke and another had had a cholecystectomy. In all there were symptoms typical of subdeltoid bursitis of sudden onset, with pain, limitation of motion and tenderness as the most prominent symptoms. All roentgenograms showed hypertrophic type of changes with calcium deposit in the bursa in one. Treatment consisted of the application of physical therapy in the form of diathermy, whirlpool or diathermy followed by massage. Splinting in a sling was carried out in the early stages and was followed by active exercise. None of the patients made a complete recovery. One patient developed a Parkinson's syndrome in the side affected when symptoms of periarthritis had almost subsided. A second patient received almost complete relief, but was left with some residual limitation of motion, while the other two patients developed symptoms later which were suggestive of rheumatoid arthritis.

All of the patients showed improvement with the use of diathermy but none showed complete cure. Roentgen rays were not used.

Dr. Kenneth Phillips (Miami): I noticed Dr. Solomon's technic in the acute case, if I understood it correctly, was to turn on the current for a few minutes, and then off. Was that because pain was increased during the acute stage or was it left on constantly?

Dr. L. D. Frescoln (Philadelphia): What position of the extremity does Dr. Solomon prefer either in the use of the roentgen rays or diathermy?

Dr. Richard Kovács (New York): I should like to make one comment on this fine presentation, and that is that the title, periarthritis of the shoulder, is appropriate. In Europe conditions such as this have been described for years under the name of omarthritis, which also means inflammation of the shoulder. In the American literature the same condition is described one time as bursitis and the next time as calcified supraspinatus tendon, when referring to the same pathologic change. Dr. Solomon's procedure of employing the term "periarthritis" is a desirable one. In addition one could, of course, specify on the basis of clinical and roentgenologic findings where most of the lesion is located.

Dr. Walter M. Solomon (closing): In answer to Dr. Hand's and Dr. Troedsson's remarks, I agree that other physical measures are helpful; however in order to determine the value of the single modality, diathermy only was used in this series. The

(Concluded on page 702)

ARCHIVES of PHYSICAL THERAPY

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.·. EDITORIALS .·.

FOOT DIFFICULTIES AND PHYSICAL MEDICINE

Foot disabilities are so prevalent that the majority of persons take them for granted. Persons may fret about their falling hair or the contour of the skin of their face, or worry about the appearance of their hands and the brilliance of their finger nails but the lowly feet are shamefully ignored. If fashion would only decree barefoot walking as proper, it would not only be physiologically correct as well as practical, but would forcibly draw attention to this part of the body. Many physicians show so little interest and intelligence about foot disorders that they are content to let their patients take their foot complaints to the chiropodist, the maker of arch supports and the irregular practitioner. Many chiropodists are capable, ethical and perform a real service. However it would seem logical that the physician should be able to diagnose and treat conditions of the foot. The problems of foot disorders are no more difficult than disorders of any other part of the body. Often these foot disorders merely represent a local manifestation of a disease or disorder elsewhere. Too often a patient whose onset of atrophic arthritis is in the feet will be fitted with heavy arch supports, or a patient with peripheral vascular disease will be cared for by a "foot specialist" and other examples might be cited when valuable time is lost in starting the correct and rational therapy.

The disabilities encountered with the feet should concern physicians who are interested particularly in physical medicine since it would seem that their specialty is adapted to the treatment of these various disorders. Although definite congenital deformities often must be corrected by surgical procedures, their aftercare belongs to physical therapy. The acquired deformities and disorders and the various strains are satisfactorily managed by physical measures. This applies not only to the weak foot due to local conditions but to the painful foot due to a more general condition such as poor posture. The infections which affect the feet are also successfully cared for by the different physical modalities whether it is acute or chronic arthritis, bursitis and the like or the prevalent mycotic infections. Peripheral vascular diseases have been of special interest to the physical therapeutist for many years since such simple measures as correct massage and specific exercises may be the most effective. In addition various mechanical devices are available which have proven to be helpful in certain conditions. Even the simple but painful plantar wart may be eliminated by electrosurgery.

The use of arch supports and various foot pads is often unwarranted and incorrect. Merely because a patient has a slight degree of pronation is not justification for subjecting him to the use of heavy plates. It is rumored that the priorities of steel in the national defense has reached the arch maker so that it is difficult to secure the supply of metal. This may be a blessing for it would appear that enough iron has been used in arch supports to build several battleships. These supports should be prescribed as specifically, intelligently and individually as any medication by a physician who should have a complete knowledge of the particular pathologic change involved. The problem of the kind shoes to be worn should receive more than the casual consideration. Many physicians believe that if a shoe is homely enough and has the title of "Doctor" attached

to it, it must be valuable. Orthopedic shoes and those with special modifications are often necessary for a definite purpose but for the majority of persons all that is required is a shoe which embodies a few simple principles.

Thus it would seem that the physical therapy physician's part in the care of disabilities of the foot is of prime importance. His knowledge and experience equips him better for treating most disorders of the foot than any other member of the medical profession. Let him realize his opportunity.

FEVER THERAPY'S SOCIOLOGIC VALUE

Syphilis of the central nervous system, particularly paresis, may so effect a person's conduct as to lead to acts against the social order which on occasion results in crime. The law justifiably confines the person to a penal institution. Society now asks that measures be taken which will rehabilitate the prisoner, if possible. Thus the use of fever therapy in treating the prisoners who are infected with syphilis should be of importance not only from a medical point of view but also because of its sociologic aspects. The person who because of his infection, may not have been entirely responsible for his acts may by the use of these therapeutic measures be restored to both a normal physical and social life. Huntley's[1] use of hyperpyrexia as given elsewhere in this issue demonstrates such spectacular results that it warrants widespread employment in other such institutions. If the only value of fever therapy rested in the ability to restore such persons to a respected place in society, that would be sufficient. The medical officer of every large penal institution in this country should be interested in reading Huntley's contribution.

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A TRIBUTE

When a job is done as expected, it is accepted; when a job is done well, it is worthy of comment; but when a job is accomplished with exceptional proficiency, it should be praised. The management of the recent convention of the American Congress of Physical Therapy was so outstanding as to call for special commendation, even at this late date. Although many members of the Congress had an active and most important part in the guidance of this session, one member merits special recognition and that is Doctor Walter J. Zeiter, the Executive Director of the Congress. On his shoulders lay the responsibility of preparing the program, appointing the valuable committees, arranging the sections, planning the space at the hotel and of organizing the many other preliminary functions, and during the meeting itself of directing the many activities to the satisfaction, pleasure and convenience of all concerned. It was a big task but that it was fulfilled competently and successfully was attested to by all who were fortunate enough to attend the meeting.

We can thank him for his unusual efforts for this past meeting and wish him continued success for the meeting in Pittsburgh in 1942.

MEDICAL NEWS

Dr. Hollender Honored at Dinner

On Saturday evening, October 11th, a group of thirty medical colleagues and their ladies, under the toastmastership of Dr. Maurice J. Rose, assembled at the St. Moritz Hotel, Miami Beach, for a surprise dinner for Dr. and Mrs. A. R. Hollender, in honor of his rise to the Presidency of the American Congress of Physical Therapy. Many high tributes were paid to Dr. Hollender and to his work as a pioneer in this field.

This gathering was significant in that only a few years ago there was practically no interest in physical therapy within this area.

On November 13, Dr. Hollender will address the Southern Medical Association at its meeting in St. Louis.

Dr. Coulter to Direct Physical Therapy at Alexian Brothers Hospital

Dr. John S. Coulter has accepted an appointment to direct the department of physical therapy at the Alexian Brothers Hospital, Chicago. The Alexian Brothers Hospital, Chicago, was established in 1880, and is a 250 bed hospital for men only.

On October 14 Dr. Coulter read a paper at the meeting of the Bureau County Medical Society held at the Perry Memorial Hospital, Princeton, Illinois, entitled "Home Treatment with Physical Agents of Chronic Arthritis."

"Underwater Exercises" was the title of the paper Dr. Coulter read before the staff of Epworth Hospital, South Bend, Indiana, on October 20. This was the occasion of the dedication of a new department of physical therapy at this hospital. Dr. Charles S. Bosenbury is the director of the department.

Meeting of the Illinois Association for the Crippled

The fifth annual meeting of the Illinois Association for the Crippled, Inc., was held November 7 at the Palmer House, Chicago. Dr. *Edward L. Compere* presided at the luncheon session, the subject for discussion being "Public Care of the Physically Handicapped." Dr. *Fred H. Albee,* New York City and Venice, Florida, Director, New Jersey Rehabilitation Commission, was the speaker.

The afternoon session was divided into three sections. Dr. Compere headed one section which discussed "Unmet Needs in Illinois and Present Services for Crippled Children."

George H. Williamson, vice-president of the association headed a symposium on "The Crippled Worker in Industry." The third section discussed "Meeting the Needs of the Severely Handicapped Adults," with Mrs. F. W. Hill presiding.

Miss Marion Clark, Director, Occupational Therapy Workshop of St. Louis, was a guest speaker.

New York Physical Therapy Society

The New York Physical Therapy Society held a Stated Meeting, November 5, 1941 at the Phi Gamma Delta Club, New York, N. Y. The following program was presented by the Department of Physical Therapy, Kings Hospital (by invitation):

1. Scientific Session —

1. Short Wave Diathermy in Non-Union of Fractures — *B. S. Miller,* M.D.

Discussion opened by *Walter I. Galland,* M.D.

2. Pertinent Points in Peripheral Vascular Diseases — *I. Muss,* M.D.

Discussion opened by *Irving S. Wright,* M.D.

3. Physical Therapy in War Injuries — *S. Towitz,* M.D.

Discussion opened by *Charles F. Bove,* M.D.

4. Ultraviolet — *John J. Hauff,* M.D.

Discussion opened by *Anthony C. Cipollaro,* M.D.

5. Electrical Testing — *Lewis Dickar,* M.D.

Discussion opened by *Joseph Moldaver,* M.D.

Clinical Congress of American College of Surgeons

The Clinical Congress of the American College of Surgeons was held in Boston, November 3 to 7. As a part of the twenty-fourth annual hospital standardization conference the staff of the Children's Hospital arranged among other presentations the following: The New Arthur T. Legg Room for Functional Rehabilitation of the Handicapped; Pool and Underwater Exercises; Other Forms of Physical Therapy, conducted by the Physical Therapy Staff of the Children's Hospital and the Harvard Infantile Paralysis Committee. Different Methods of Physical Therapy for Children, conducted by *Janet Merrill.*

A Defense Program for the Children of the United States—U. S. Department of Labor Children's Bureau, Washington

In preparing for the defense of a free society our concern must be the safety and welfare of every child, for children bear within themselves the future of the Nation.

Toward this end —

The Children's Bureau of the United States Department of Labor is cooperating with other Federal agencies and with State and local governments and organizations of citizens. These efforts are coordinated with those of other Federal agencies through the Office of Civilian Defense and the Office of Defense Health and Welfare Service.

State Councils of Defense in cooperation with the official agencies of the State and citizens' groups should give full consideration to the needs of children within the State and take action to assure their safety and well-being. This may be accomplished through a committee of the Council, a State organization for follow-up of the recommendations of the White House Conference on Children in a Democracy, or some other appropriate interdepartmental organization or citizens' group working in cooperation with official agencies. In some States a State-wide conference on the needs of children in relation to the defense program may be desirable.

Local communities should provide for similar cooperative effort on the part of official agencies, private health and welfare agencies, and citizens.

Individual citizens who volunteer for service in the defense program should give special consideration to the needs of children.

Parents should inform themselves of these activities and be prepared to participate fully in the opportunities they offer.

The objective in this defense program for children is to make sure that children everywhere in the United States are: (*a*) safe; (*b*) healthy, existing services for child health should be maintained at a high level of efficiency; special services should be provided to assure throughout the Nation continuous health supervision for all children, medical, surgical and dental care as needed to assure the health of infants, preschool children, school children, and youth who have left school; (*c*) strong; (*d*) secure; (*f*) well-prepared; (*g*) happy, resourceful, and able to cooperate with others to include special planning for the recreational needs of children and youth in military and industrial defense areas; (*h*) free from child labor and from youth employment under conditions of special hazard; (*i*) tolerant; (*j*) upright, and (*k*) understanding.

KATHARINE F. LENROOT,
Chief, Children's Bureau.

Swift Fellowships for Research in Nutrition

Scientific attack on problems of the American diet was furthered with the announcement by Charles H. Swift, chairman of the board of directors of Swift & Company of the establishment of a series of fellowships for research in nutrition. The fellowships are intended to aid the Federal government in its long-range national nutrition program.

The fellowships provide for special research to be undertaken in laboratories of universities and medical schools with funds which the company has set aside as grants in aid, beginning November 1, 1941. The fellowships will be for one year but may be renewed where the project warrants it.

Any fundamental study of the nutritive properties of foods or the application of such information to improvement of the American diet and health will be eligible for consideration for a grant, according to Dr. R. C. Newton, vice-president in charge of the company's research laboratories, who will coordinate the program.

"A higher level of nutrition for the better health of all Americans is an integral part of national progress," Mr. Swift pointed out in making the formal announcement. "To advance fundamental knowledge of foods and to discover or develop ways to feed our Nation better and make our people healthier, happier, and more efficient, Swift & Company has undertaken to expand its support of nutrition research. The fellowships in nutrition are designed further to enlist the country's research talents and facilities in order to achieve the long-range objectives of the national nutrition program and the immediate aims of national defense."

Training of the Disabled

We learn in a news item from London that it was considered a mistake after the last war not to put into operation a scheme to give ex-service men a chance to do something more than draw pensions. The English government is now considering a plan not merely for the rehabilitation of these men but for training them for some useful occupation.

Defect In Body's Use of Fat May Cause Artery Hardening

Hardening of the arteries, technically termed arteriosclerosis, may be a fat disease in the way that diabetes is a sugar disease, it appears from studies reported by Dr. Lester R. Dragstedt, of the University of Chicago, to the National Academy of Sciences meeting in Madison, Wis.

The condition is not a necessary part of the aging process, Dr. Dragstedt said, since not all old people develop it.

When the pancreas fails to produce enough insulin, the utilization of sugar is defective and diabetes results. Failure of the pancreas to produce another hormone, called lipocaic, disturbs the utilization of fat and arteriosclerosis results. This is the case in dogs and maybe humans.

A high percentage of dogs developed arteriosclerosis when deprived of lipocaic by removal of the pancreas, Dr. Dragstedt found.

Hardening of the arteries occurs with abnormally high frequency in patients with diabetes, Dr. Dragstedt pointed out, and occurs not infrequently in young persons. Diets rich in fat are especially apt to produce the artery hardening in diabetics and, conversely, low fat diets have a protective effect.

Further experimental evidence for the theory of arteriosclerosis being a result of disturbed fat utilization was obtained by feeding rabbits an excessive amount of cholesterol. This fatlike chemical constitutes a large part of the most frequently occurring type of gallstones and occurs in the thickening in the artery walls in a certain type of arteriosclerosis. The rabbits fed the excessive amounts of cholesterol developed an artery hardening which resembled very closely the human disease. — *Science News Letter.*

Ottawa
Department of Transport
Radio Division

Suppression of Inductive Interference From Spark Gap Electro-Medical Apparatus

The necessity of protecting radio communications, including those used by the fighting services, as well as broadcast reception, has obliged the Department of Transport to bring in regulations prohibiting, after January 1st, 1942, the use of spark-gap type diathermy apparatus and mechanical rectifiers for x-ray installations, unless such equipment is adequately shielded, thereby confining the radiation within reasonable limits, or their interference otherwise suppressed.

The severity of the radio interference created by spark-gap discharges is, of course, well known to the operators of this equipment; it is quite capable of seriously interfering with normal reception over wide areas on broadcast frequencies and the detrimental effect to short-wave commercial and war communications is equally pronounced, even at greater distances.

In 1925, engineers of the department initiated research work on the problem with a view to developing an economic means of suppressing this interference, and over the past fifteen years numerous types of suppressors have been constructed and tested under various conditions, every avenue being explored in an endeavor to solve the problem by providing a low-cost but efficient filter. From the mass of material accumulated it has become clear that filters alone will seldom provide the answer; complete shielding of the operating room or rooms, together with a suitable surge trap in the supply lines has been found necessary. Similar conclusions have been reached by the leading manufacturers of electro-, medical equipment who have expended considerable money over a period of years in an effort to develop economic measures of interference suppression for their particular products. Perhaps the most exhaustive researches along this line are those carried out by technical officers of the British Government and, here again, published reports indicate that complete shielding is a primary requisite for the suppression of this type of interference and is now being enforced in Great Britain.

For the present, the regulations in Canada will not apply to short-wave therapy installations, unless they seriously interfere with some vital radio communication. It is not unlikely, however that they will ultimately be extended to include this equipment as well. It has been suggested that specially designed apparatus of this type might be permitted to operate in a restricted frequency band, thereby obviating the necessity of shielding, but the indications are that such special equipment will not be available for several years — if at all. It has been pointed out too, that, should the development of a suitable machine prove to be technically feasible, its cost is likely to be considerably above the present average — the difference possibly being in excess of the outlay for shielding a moderately sized room.

From the foregoing, the desirability of immediate action to suppress radio interference affecting vital communications will be apparent, and it is anticipated that appropriate steps will be taken by practitioners, without delay. In order, however, that no undue hardship be caused the parties concerned, the Department of Transport has set the date for compulsory interference suppression as January 1st, 1942.

American Congress of Physical Therapy to Be Represented at Meeting of The National Conference on Employment of the Disabled

The National Rehabilitation Association is sponsoring the National Conference on Employment of the Disabled on November 21 to 24 at the Wardman Park Hotel, Washington, D. C. The purpose of this conference is to promote the employment of the disabled by arousing national interest and confidence in the ability of these people to render valuable service in competitive employment and to contribute to the defense needs of the nation.

Greetings from the American Congress of Physical Therapy will be extended by Dr. A. R. Hollender; Dr. Madge C. L. McGuinness, Chairman of the Eastern Section of the Congress, will read a paper on "Physical Therapy as an Aid in the Rehabilitation of the Injured Workman."

Dr. Stanton P. Hull 1886-1941

It is with regret that we announce the death of Dr. Stanton P. Hull. Dr. Hull was born in 1886, was graduated from the Albany Medical College, Albany, New York in 1908 and was licensed to practice medicine the same year. He was a Fellow of the American Medical Association and an active member of the American Congress of Physical Therapy for a number of years.

Dr. Alfred Freudenthal 1880-1941

Word has been received at the central office of the Congress of the death of Dr. Alfred Freudenthal of Trinidad, Colorado. Dr. Freudenthal was graduated from Gross Medical College of Denver in 1902. He had been a member of the American Congress of Physical Therapy for a number of years.

BOOK REVIEWS

PHYSICAL THERAPY IN NURSING CARE. By *George Knapp Abbott*, A.B., M.D., F.A.C.S., Medical Director and Surgeon, St. Helena Sanitarium and Hospital; *Fred B. Moor*, A.B., M.D., Professor of Pharmacology and Therapeutics, College of Medical Evangelists; Director of Physical Therapy, White Memorial Hospital, Los Angeles, California, and *Kathryn L. Jensen-Nelson*, R.N., Formerly General Director of Physical Therapy Instruction in the Washington Sanitarium and Hospital School of Nursing, Takoma Park, Maryland. Ed. 3. Cloth. Pp. 483 with 97 illustrations. Price, $3.50. Washington, D.C.: Review and Herald Publishing Association, 1941.

This book is divided into five sections, hydrotherapy, massage and exercise, electrotherapy, light therapy and applied therapeutics. As in the former editions of a similar text entitled, "Physical Therapy for Nurses," by the senior author, the largest section is devoted to the subjects of hydrotherapy and massage. The authors believe that it is in this field of hydrotherapy and massage that the nurse most frequently finds a ready agent for the application of heat and cold and that in basic nursing care the nurse routinely employs the application of hydrotherapy and massage. The sections are arranged in the order of their relative importance to the nurse. This edition has been thoroughly revised and a large number of new illustrations has been added. A number of case histories have been included to indicate the use of physical therapy in specific types of cases. This volume can be recommended highly as a textbook for schools of nursing.

PLAY FOR CONVALESCENT CHILDREN IN HOSPITALS AND AT HOME. By *Anne Marie Smith*, Staff Instructor, Leaders' Training School, Community Recreation Service, Chicago, Illinois. Cloth. Price, $1.60. Pp. 133, New York: A. S. Barnes and Company, 1941.

A child's psychologic needs are the same whether he is sick or well. In addition to medical and surgical care the child in the hospital needs love and security; interesting, satisfying, and instructive activity; satisfying social relations as well as responsibility and release from emotional tensions. Psychologists believe that if these needs are not satisfied, the child will develop disorders of behavior. Miss Smith presents graphically the well-rounded program for play of the Children's Memorial Hospital in Chicago where she has conducted play therapy for almost six years. The experience demonstrates that play is effective when organized as an integral part of the hospital care of children and as a fundamental part of the education of pediatric nurses. This book can be recommended to physicians, hospital administrators, nurses and parents who wish to learn what play has accomplished in changing children's fear of hospitals and in giving them greater confidence in physicians and nurses.

THE EARLY TREATMENT OF WAR WOUNDS. By *William Anderson*, O.B.E. (Mil.) M.B., Ch.B., F.R.C.S., Surgeon and Lecturer in Surgery, Aberdeen Royal Infirmary, Surgeon to Municipal Hospitals, Aberdeen, Surgical Director, Emergency Medical Service, Northern and Northeastern Districts. Oxford War Manuals. General Editor, The Rt. Hon. *Lord Horder*, G.C.V.O. Cloth. Pp. 96 with 12 illustrations. Price, $1.50. London: Oxford University Press, 1941.

During the war of 1914-18 the Oxford War Primers achieved a high degree of popularity among the members of the medical profession. The advances in military, no less than medical, science have been so great that an up-to-date series has been called for. Hence this issue of Oxford War Manuals proceeds from the same University Press. This manual describes the surgical treatment of wounds at advanced units; work at the casualty clearing station; principles of treatment of wounds at the casualty clearing station; wounds of the brain and of its covering; penetrating wounds of the abdomen; penetrating wounds of the thorax; wounds of the joints and other special injuries. Every medical officer should read this book. It has many good facts about the treatment of wounds. In his preface the author shows that he knows the thoughts of young medical officers. He states: "Accustomed as he has been to independent thought and action since graduation days, the young medico finds discipline irksome and even stupid. What does he know of latrines, cook-houses, etc., and why should he inspect men's quarters, dinner and so forth? It takes some little time for one to realize that all those duties are essential if the unit is to run smoothly and well in times of stress, and that even the application of a Thomas' splint by numbers is, when training orderlies and stretcher-bearers, the only efficient and fool-proof method."

THE TREATMENT OF BURNS. By *A. B. Wallace*, M.B., F.R.C.S., Ed., M. Sc. (McGill), Surgeon, Scottish Emergency Medical Service, Assistant, Department of Surgery, University of Edinburg; Assistant Surgeon, Royal Hospital for Sick Children, Edinburg. Oxford War Manuals. General Editor, The Rt. Hon. *Lord Horder*, G.C.V.O. Cloth. Pp. 113 with 16 illustrations. Price, $1.50. London: Oxford University Press, 1941.

This is one of the first two Oxford War Primers. The author has successfully presented the subject of the treatment of burns in a compact form for practical application. He considers the problem under the following heads: the classification of burns;

the clinical course of burns; the complications of burns; the treatment of burns; diet in the treatment of burns; the use and abuse of tanning methods; special types of burns; and hospital organization, segregation and nursing care of burns. Since the outbreak of the present war the British medical profession has had to treat many burns among the civilian population and among the members of the Navy, Army and Air Forces. The author of this manual believes that the use of tanning agents in the treatment of burns has been one of the outstanding features of recent advances in surgery, but there are still problems in this field to face and solve. He states that up to the time of writing the employment of one of the tanning agents is undoubtedly the method of choice in the treatment of burns. The use of coagulation methods for treatment in extensive superficial burns is essential to save life, but in smaller deep burns, life as a rule is not endangered and the primary consideration becomes the limitation of infection and the prevention of deformity. The latter group forms the main problem at this time. This work is recommended to physicians both in civil and military practice.

TRAUMA AND DISEASE. Edited by *Leopold Brahdy*, B.S., M.D., Physician in Charge of Occupational Diseases and Injuries in the Office of the Corporation Counsel of the City of New York. Lecturer in Radiology, New York University Medical School; and *Samuel Kahn*, B.S., M.D., Medical Examiner in the Bureau of Workmen's Compensation of the Department of Labor, State of New York, New York City. Second Edition. Cloth. Pp. 655. Price, $7.50. Philadelphia: Lea & Febiger, 1941.

The role of trauma in producing disease is unquestionably overestimated by the lay public. On the other hand, the editors believe there is a tendency on the part of some physicians to deny the significance of injury to too great an extent. This volume is really a symposium presented by authorities in their individual fields. The list of contributors is an imposing one. Gynecologic and obstetric conditions are presented by Fred L. Adair, M.D., Professor of Obstetrics and Gynecology, University of Chicago; pulmonary diseases, by George Blumer, M.D., Clinical Professor of Medicine, Emeritus, Yale Medical School; genito-urinary diseases, by Hugh Cabot, M.D., Professor of Surgery, The Mayo Foundation; diseases of the gastro-intestinal tract, by Burrill B. Crohn, M.D., Associate in Medicine, Mt. Sinai Hospital, New York; peripheral vascular diseases, by Geza de Takats, M.D., Associate Professor of Surgery, University of Illinois; mental disorders, by Franklin G. Ebaugh, M.D., Professor of Psychiatry, University of Colorado; diseases of the thyroid gland, by Emil Goetsch, M.D., Professor of Surgery, Long Island College of Medicine; diseases of the bones, by Robert J. Joplin, M.D., Assistant in Orthopedic Surgery, Harvard Medical School; diabetes mellitus, by Elliott P. Joslin, M.D., Clinical Professor of Medicine, Harvard Medical School; neoplasms, by Leila C. Knox, M.D., Pathologist to St. Luke's Hospital, New York; septicemia, by Reuben Ottenberg, M.D., Associate Attending Physician to Mt. Sinai Hospital, New York; pulmonary tuberculosis, by Edward N. Packard, M.D., Assistant Director, Trudeau Foundation; chronic diseases of the joints, by Ralph Pemberton, M.D., Professor of Medicine, Graduate School of Medicine, University of Pennsylvania; diseases of the nervous system, by Lewis J. Pollock, M.D., Professor of Nervous and Mental Diseases, Northwestern University; neuro-syphilis, by Harry G. Solomon, M.D., Assistant Professor of Psychiatry, Harvard Medical School; diseases of the spine, by Arthur Steindler, M.D., Professor of Orthopedic Surgery, State University of Iowa; and diseases of the heart, by Paul D. White, M.D., Assistant Professor of Medicine, Harvard Medical School. This work shows the effect of a single trauma, either physical or psychic, in producing disease and in influencing its course. The rise of accident rates, and the increase of compensation laws make this book a necessary part of the library of every physician doing industrial medicine and surgery.

IMMUNITY AGAINST ANIMAL PARASITES. By *James T. Culbertson*, Assistant Professor of Bacteriology, College of Physicians and Surgeons, Columbia University. Pp. 274. Cloth. Price, $3.50. New York: Columbia University Press, 1941.

The author has attempted to "supply a text which will be of value to those just beginning the study of immunity to the parasitic forms, by acquainting them with the fundamental principles of the subject as now understood." It is designed for the beginning student, the trained investigator, and the practicing physician or veterinarian who are presumed to be well trained in parasitology and immunology. The author has confined himself, after the introductory chapter, to a review of the literature beginning in 1929 to the present time. The book is divided into three parts. Part one deals with the general considerations of natural resistance and acquired immunity. Part two gives a detailed account of immunity to specific diseases while part three deals briefly with applied immunology. The book is confined to that restricted scope where two highly specialized sciences overlap and is therefore of limited interest to the average physician. Much of the material is of academic interest without wide clinical applicability at the present time. It should however prove valuable to investigators in the fields of parasitology as applied to tropical and veterinary medicine.

FOUNDATIONS OF BIOLOGY. By *Lorande Loss Woodruff*, Ph.D., Professor of Protozoology, Director of the Osborn Zoological Laboratory, Yale University. Edition 6. Cloth. Pp. 773 with 469 drawings and photographs. Price $3.75. New York: The Macmillan Company, 1941.

This well known work is a readable and authoritative textbook in general biology. It is well illustrated by text figures, some of which are new. The

majority of these figures are drawings but the rest are photographs. No colored illustrations appear in the book. Nearly every chapter is introduced by an interesting and pertinent quotation from some well known scientist. Although there is no chapter devoted exclusively to biochemical and biophysical phenomena, some new material of this nature has been introduced. A new chapter on human ancestry also appears in this edition. There is a good index, an excellent bibliography, and a glossary. The book, according to the author, is intended for the college student and the general reader, but it appears to the reviewer that it would be a useful addition to the library of the physician.

A TEXT-BOOK OF PATHOLOGY. Edited by *E. T. Bell*, M.D., Professor of Pathology in the University of Minnesota. Fourth edition, enlarged and thoroughly revised. Cloth. 431 engravings and 2 colored plates. Pp. 931. Price $9.50; Philadelphia: Lea & Febiger, 1941.

The bridging between the subjects of "dead" pathology and live clinical medicine has received increased attention from medical teachers in recent years, and the fourth edition of the standard text of Bell indicates that full cognizance has been given to this desirable movement by including pathologic physiology in conjunction with the discussion of the pathologic condition in the majority of cases. Thus clinical medicine becomes a direct continuation of the study of pathology. The subject of pathology is presented as a living science of the nature and causes of disease in 29 clearly written and exceedingly well illustrated chapters, 3 of which are contributed by B. J. Clawson, M.D., Professor of Pathology and J. S. McCartney, M.D., Associate Professor of Pathology, both in the University of Minnesota. All phases of recent progress in pathology and pathologic physiology have been carefully and conservatively included. The new edition is not only a desirable textbook for medical students, but also an up-to-date and practical reference book for all physicians. The typography is of the usual excellence of the publishers.

THE ROENTGEN DENSITY OF THE CYSTINE CALCULUS. A Roentgenographic and Experimental Study Including a Comparison with more Common Uroliths. By *Axel Renander*. English Translation by *Catherine Djurklou*. Paper. Pp. 148. Stockholm: Kungl. Boktryckeriet, P. A. Norstedt & Soner, 1941.

This is a paper bound book of excellent typography. It represents a research study of 37 cases, of cystinuria, all the known cases in Sweden. Lithiasis complicated 27 and 18 were examined radiographically. Chemical, roentgenographic and photometric studies were made to determine whether pure cystine calculi could be demonstrated on the x-ray film. Case reports include when possible, anamnesis, roentgen report and print operation, chemical analysis and photometric examination. There are many reproductions in black and white and one plate in natural color. Pure cystine calculi were formerly thought to be difficult to visualize on the roentgenogram but some contain other salts which have greater density, causing them to show clearly. The pure cystine calculi are clearly visualized by modern technic, as reported by Hammer and Thompson of the Mayo Clinic, 1940, and so proven by the investigation of the author.

TEXTBOOK OF GENERAL SURGERY. By *Warren H. Cole*, M.D., F.A.C.S., Professor and Head of the Department of Surgery, University of Illinois College of Medicine; Surgeon, Illinois Research Hospital, Chicago, and *Robert Elman*, M.D., Associate Professor of Clinical Surgery, Washington University School of Medicine; Assistant Surgeon, Barnes Hospital; Associate Surgeon, St. Louis Children's Hospital; Director of Surgical Service, H. G. Phillips Hospital, St. Louis. Third Edition. Cloth. Pp. 1067 with 558 illustrations. Price, $8.00. New York: D. Appleton-Century Company, 1941.

This is the third edition of this work which was first published in 1936. The original plan has been continued. Detailed consideration of such specialties as ophthalmology, otology and rhinology are eliminated although many features of these specialties with which the general surgeon must be acquainted are included. Separate chapters are assigned to the specialties of genitourinary surgery and gynecology. Certain features of neurosurgery are included. Because of the influence of war on surgical procedures, particular attention is paid to open wounds and burns. Numerous changes and additions have been made in the section on fractures; the material on amputations and on anesthesia has been enlarged and now appears as separate chapters; the effectiveness of the sulfonamide compounds, especially in wounds and abdominal operations, has required extensive additions. The subject matter is presented as far as possible from a physiologic point of view. Pathogenesis is emphasized in order to bring the rationale of treatment into bolder relief. The details of nonoperative therapy are fully covered. Except in a few common instances, operations are not described in detail although they are discussed in principle. This is because of an excellent point of view of the authors that the description of most operations involves such extensive detail that in a single volume there is insufficient space to include them in an adequate manner. The authors believe that to present incomplete descriptions of operative technic often is misleading and actually may be dangerous. Sources for details of operative technic are given. The volume is highly recommended because it presents in a concise manner information of the surgical conditions with which every general medical practitioner and medical student should be more or less familiar. The list of distinguished consulting collaborators assures the reader the most up-to-date thoughts on each subject presented.

PHYSICAL THERAPY ABSTRACTS

Cause of the So-Called Side Ache That Occurs in Normal Persons. Richard B. Capps.

Arch. Int. Med. **68**:94 (July) 1941.

The "side ache," or "stitch in the side," that occurs with exercise in normal persons is well known to layman and to physician alike.

One hundred and fourteen attacks of so-called side ache were personally observed in 55 different persons.

Physical exertion of some kind was always the chief precipitating factor. Simple twisting or bending of the body alone was never observed to cause this pain. The requisite type of exercise varied from walking to strenuous running, including both sprints and the longer distances, up to 2 miles.

The effect of physical training was also variable. In 2 persons the side ache definitely disappeared with training, and in 3 others it continued to be present despite excellent training. This variability was confirmed by several coaches, who agreed that in some persons the pain was only present when the physical condition was poor or when the person was "warming up." Yet in other cases no matter how excellent the training, the pain persisted. In some persons it is so severe that nausea and vomiting ensue. Although in a few cases the pain may disappear even though the exertion is continued, this is not usually so. Thus there seems to be no definite relation to the "second wind."

The outstanding characteristics are found to be a constant relation to exertion, a tendency to occur after eating, a variable location, usually in either the right or the left upper quadrant of the abdomen, relief obtained from bending over or from local pressure and a tendency to be aggravated in cold weather.

The previously proposed theories regarding the mechanism of pain are shown to be untenable. A new explanation of the pain is suggested, namely, anoxemia of the diaphragmatic muscle. This theory explains all of the observed facts in a satisfactory manner.

The Surgical Treatment of Arthritis. Frank D. Dickson.

Ann. Surg. **113**:869 (May) 1941.

The use of surgery may play a successful role in the relief of the arthritic patient when the arthritis is in the quiescent stage, the pathologic changes have been properly evaluated and the loss of function in important joints has resulted in incapacitating disability. When these criteria are met, it is frequently possible in properly selected cases, by a carefully planned surgical attack on one or more joints to convert a helpless invalid into a reasonably active person, who can take care of himself and at times become self-supporting. The following are those most commonly employed: (1) manipulation: employed when the capsule and ligaments are the chief cause of joint deformity; (2) capsuloplasty: employed when the capsule and ligaments are the chief cause of joint deformity; (3) synovectomy: employed: (a) to remove a focus of infection; (b) when there is extensive involvement of the synovia and articular cartilages and a badly damaged but salvageable joint; (4) arthroplasty: employed to restore motion in ankylosed but important joints; (5) arthrodesis: employed when joint damage is so complete as to preclude the restoration of useful function in a joint where stability is more important than movement.

Manipulation, although it has fallen into some disrepute because it is so often confused with the cult of osteopathy, is an important part of the armamentarium of the surgeon. It is useful in the correction of the less severe arthritic joint deformities due to contracture of the ligaments, capsule and muscles without serious joint damage. Manipulation, always carried out under anesthesia, should employ only gentle maneuvers; rough and forcible manipulation, as a rule, excites a severe local reaction, which usually results in a rapid return of deformity and decreased joint motion. After manipulation, carefully supervised active movements should be started within twelve to twenty-four hours, and the range increased from day to day in order that full advantage may be taken of the improved position and range of movement in the joint. It is undesirable to fix in plaster a joint which has been manipulated; and if such fixation is carried out, it should be for only a few days. If a joint is immobilized longer, there is danger of losing much of the movement gained by manipulation. Traction is much better than plaster for fixation purposes. Manipulation is best adapted to the correction of mild contractures of the knee, shoulder, wrist, and feet.

Capsuloplasty has for its purpose lengthening the contracted joint capsule sufficiently to allow complete extension of the joint without the use of force. After closure of the wound, a plaster encasement may be applied or traction employed to hold the knee in extension and overcome what slight residual flexion deformity may remain—we prefer traction. Motion should be started in a week and the range rapidly increased.

By synovectomy is meant the complete removal of an hypertrophied and diseased synovial lining which interferes with joint function. The type of case which benefits most from a synovectomy is the so-called villus arthritis, which is characterized by a boggy, swollen knee, fixed in a greater or less degree of flexion so that standing and

walking are difficult or impossible. A properly performed synovectomy followed by carefully supervised after-care gives, in such cases, surprisingly satisfactory results, both as regards relief of pain and the return of useful function.

The operation of arthroplasty consists of making a new joint to replace one rendered stiff and immovable by arthritis. Such an artificial joint is produced by resecting a considerable amount of bone, reshaping the bone ends entering into the joint in such a manner as to allow motion in normal planes, and placing between the bone ends some tissue, usually fascia lata, to prevent recurrence of the fusion between them. The after-treatment consists in carefully supervised physical therapy.

The Value of Convalescent Care of Rheumatic Children. Leo M. Taran.

J. Pediat. **18**:737 (June) 1941.

That home environment seems to play a significant role in the natural history of rheumatic disease has been discussed for many years. Observations point to the fact that the reactivation of the rheumatic process finds a more fertile field in a poor home environment than in a good one. It is significant that children who come to the sanatorium from a poor home environment are as free from rheumatic recurrences while at the sanatorium as those who come from a good home environment. Furthermore, it was shown that children who return to a good home environment after convalescent care have significantly fewer recurrences than those who return to poor living conditions.

One hundred and ten rheumatic children, six to fourteen years of age, were observed at the St. Francis Sanatorium for Cardiac Children. This group was compared with a control group of 110 children from the Kings County Children's Cardiac Clinic. The period of observation was the same in both groups (thirty-six months). The treated group gained three times as much weight as the control group in the same period.

The incidence infection of the upper respiratory tract in the treated group was one-quarter that of the control group for the same period of time.

Primary Repair of Tendons. Study of End-Results in Two Hundred and Seven Cases. Martin Debenham.

California & West. Med. **54**:273 (May) 1941.

The care of an injured tendon is only begun when the patient leaves the operating room. The problem of postoperative motion involves a balance between the two factors: the strength of the suture line and the formation of adhesions.

Those who advise immediate institution of motion do so because they feel that the development of structure is in response to function. Diering, Barfurth, Rehn, and others, have shown that under the influence of function the nuclei and fibers arranged themselves in rows parallel to the line of the pull, but otherwise remained non-oriented. Rehn further claimed that under the stimulus of function, grafted tissue took on a tendon-like character by metaplasia. Rebbert, however, felt that function plays only a minor part.

Garlock called attention to a general, unfounded feeling among surgeons that "something happens to the suture line between the fifth and ninth days" which makes it unsafe to begin motion until after that time. He has shown that there is a steady increase in strength of the scar from the first day and that the suture material is of value only during the first three to five days. He further stated that because the surgeon cannot gauge the amount of tension, it is unwise to attempt passive motion before the fifteenth day. Active motion within the limits of pain is encouraged by him as early as the fifth day.

These motions need be through only a narrow range and need involve only the distal phalanges of the fingers to prevent adhesions. Meanwhile the wrist joint is immobilized in position to assure adequate relaxation of the tendon to prevent strain on the suture line.

Late initiation of motion must destroy the adhesions which have formed. Its success depends on the strength of the suture line as compared with the adhesions.

Physical Fitness. Ernst Jokl, and E. H. Cluver.

J. A. M. A. **116**:2383 (May 24) 1941.

Theories on and concepts of physical efficiency will automatically change when more physiologic and clinical experiences in this field are presented in the medical literature. This, however, will be possible only if the amount of research conducted on this subject is in accordance with its practical importance.

These authors believe that a closer study of the medical aspect of physical efficiency will introduce a new dynamic concept into clinical medicine. Such a study will develop a strong sense of reality by placing the medical implications of economic, social and educational problems in their correct prospective. It will facilitate new applications of physiologic information to hitherto neglected clinical issues. It will show the extent to which functional adjustments are possible in the healthy as well as in the diseased human organism; it will thus take medicine further away from an era in which anatomic changes are regarded as the sole criteria for the interpretation of physiologic and pathologic conditions.

The physical improvement of substandard recruits obtained in a six months training course and the economic implications of such improvement are noteworthy.

An interracial survey of the physiologic growth of physical efficiency, conducted with English, Afrikander, Jewish, Bantu, Cape Colored, Indian and Chinese children, revealed a striking similarity between the standards of physiologic performance of the different racial groups.

The effect of puberty on the growth of physical efficiency is noteworthy. It is desirable to collect

more evidence on the relationship between subclinical nutritional deficiences and physical efficiency.

Clinical evidence demonstrates the fallaciousness of many accepted clinical concepts of the relationship between disease and physical efficiency.

The Infra-Red Absorption Spectra of Estrogens, Androgens and Related Steroids. Carl M. Herget and Ephraim Shorr.

Am. J. Physiol. **133**:323 (June 1) 1941.

The infra-red spectra of a number of androgens, estrogens and related steroids in the solid state have been obtained using the J. D. Hardy infra-red spectrophotometer. Unlike visible and ultra-violet absorption spectra, which reflects the electronic state of the molecule, the appearance of the infra-red absorption is determined by atomic groupings. This region, therefore, could be expected to yield unique absorptive spectra. Other advantages of the method are its rapidity, only one scanning being necessary for a complete analysis and the small samples required (3-5 mgm.) which are unaffected by the analysis.

Among the compounds studied in the pure state were androsterone, dehydroandrosterone, androstenedione, isoandrosterone, dehydroisoandrosterone, testosterone, androsterone, benzoate, alphaestradiol dipropionate, cholestenone, desoxycorticosterone, pregnenolone, progesterone, cholestanone and cholesterol.

These compounds in the solid state have unique infra-red absorption spectra, except spacial isomers which have similar spectra. Experiments are in progress which promise to permit the differentiation of spacial isomers by carrying out the observations in appropriate solvents. From these spectra it can be determined with certainty whether certain groups, such as the ketonic and hydroxyl, are present. Ketonic and hydroxyl groups on the 3-carbon atom can usually be distinguished from those on the 17-carbon atom.

The method is applicable to the analysis of compounds present in biologic fluids.

Contraindications and Precautions in Administration of Short Wave Therapy. K. R. Speeding.

Brit. J. Phys. Med. **4**:50 (April) 1941.

Despite the apparent freedom from any permanent ill effect, there are several conditions in which use of short wave diathermy is not of assistance. These conditions are more satisfactorily treated by some other method. The first of these conditions is the rapidly advancing type of malignant disease.

Secondly there is a group of abnormalities in which the use of short wave diathermy is perhaps inadvisable. The cases in this group comprise lesions situated in the abdomen and elsewhere, in which surgical treatment has been decided on, and the date of operation arranged for the near future. It is possible that the operative procedure may be rendered unusually difficult by any preliminary applications of short wave diathermy.

Thirdly, it is necessary for the practitioner to remember that, among the gynecologic lesions, there is one abnormality in which short wave therapy, while not being absolutely contraindicated, is undesirable as a rule. This pathologic condition is observed fairly often in practice, and is characterized by the occurrence of menorrhagia, or perhaps of metrorrhagia.

Abscess formation, deeply seated, which does not have natural or artificial facilities for drainage must be treated cautiously if the possibility of a severe initial reaction is to be avoided. These lesions appear to be satisfactorily treated by small doses at the commencement of the course.

Environmental Temperatures and Thiamine Requirements. C. A. Mills.

Am. J. Phys. **133**:525 (July 1) 1941.

Optimal thiamine requirement for rats (per Gm. of food or per calory) is found to be twice as high at 91 as at 65 F. environmental temperature. Protection against the severe effects of excessive heat is afforded by an accessory thiamine intake above the ordinary daily need. Discussion is offered of the bearing these facts may have in regard to the problems of human existence under conditions of depressive heat.

The Influence of Cold and Heat On the Vago-Insulin and the Sympathetico-Adrenal Systems. E. Gellhorn, and J. Feldman.

Am. J. Physiol. **133**:670 (July 1) 1941.

Normal (A), adreno-demedullated (B), vagotomized (C), and adreno-demedullated-vagotomized (D) rats were exposed to cold by immersion in water of 2 to 4 C. for ten minutes or to heat by keeping them at an environmental temperature of 31 to 32 C. for six hours. On exposure to cold, group A reacted with a hyperglycemia, B with hypoglycemia and D showed no significant change in blood sugar. The experiments show that cold acts on both vago-insulin and sympathetico-adrenal systems, the effect predominating on the latter. On exposure to heat group A reacts with a delayed hypoglycemia, B with hypoglycemia persisting during the whole period, C with a hyperglycemia and D with no significant change in blood sugar. Heat also acts on both vago-insulin and sympathetico-adrenal systems but the predominant effect is on the former. The significance of these reactions for homeostasis is discussed.

Combined Artificial Fever, Chemotherapy and Vaccinotherapy in Neurosyphilis. Albéric Marin.

Canad. M. A. J. **44**:161 (Feb.) 1941.

In the Department of Dermatology and Syphilology of Notre Dame Hospital the author has been using the chemo-vaccino-physicopyretotherapy for twenty-seven months with good results.

Hyperthermal cabinets are used, to which a short wave apparatus can be connected if desired. From October, 1937, to January, 1940, 220 patients suffering with various ailments (syphilis, chorea, multiple sclerosis, gonorrhea, etc.) have received 1,318 treatments of about five hours each at a temperature of 105 F. A total of 7,568 hours of treatment (at 105 F.) was given. One death occurred, which gives a death rate of about 0.4 per cent. The total of 220 patients is given to indicate the death rate by this method. Of this number, 137 patients were syphilitic. As a routine a lumbar puncture was made immediately before the artificial fever treatment and another immediately after.

Artificial pyrexia has been combined with the use of vaccines and drugs in the management of nervous syphilitics. In dementia paralytica this method resulted in 54 per cent full remissions. In tabes 7 patients of 12 were improved. The immediate serologic results in 89 patients show a fair proportion of spinal fluids having a marked tendency to reverse. The strongly positive fluids have decreased by 20 per cent. In 50 patients who followed an adequate drug treatment during an average time of one year (after artificial fever) there are 22 per cent negative spinal fluids.

Use of Digitalis to Prevent Exaggerated Acceleration of the Heart During Physical Exercise in Patients with Auricular Fibrillation. Walter Modell, Harry Gold, and Harold H. Rothendler.

J. A. M. A. **116**:2241 (May 17) 1941.

The author in his summary stated that 1. The average patient with auricular fibrillation has acceleration of the ventricular rate during exercise, chiefly, if not entirely, by decrease of the vagal tone. In these cases blocking the vagus by means of atropine accelerates the ventricles to the same maximum level as extreme physical exertion.

2. There is an indication that in some patients, especially those with advanced heart failure, an accessory mechanism for acceleration may also be invoked during extreme physical effort.

3. Exaggerated acceleration of the ventricles, caused by physical exercise in patients with auricular fibrillation, can be prevented in most cases by "extravagal" digitalization, a state in which the ventricles are slowed chiefly by the direct action of digitalis on auriculoventricular conduction and in which vagal tone has been, for the most part lost. It is produced by relatively large doses of digitalis. In this state, the ventricular rate rarely exceeds 100 beats a minute after the vagi are blocked by atropine or after severe physical effort.

4. The rate of the ventricles during rest does not disclose whether the digitalis has caused the slowing by the "vagal" or by the "extravagal" mechanism. There are two methods for determining "extravagal" digitalization: (1) the atropine test (the intravenous injection of 2 mg. of atropine sulfate) and (2) physical exercise. After neither of these tests will the ventricular rate rise appreciably above 100 beats a minute if enough digitalis has been given to cause slowing by the extravagal mechanism.

Temperature Swing in Treating Dementia Paralytica. H. C. Solomon; I. Kopp, and A. S. Rose.

Am. J. Syph., Gonor. & Ven. Dis. **25**:96 (Jan.) 1941.

Solomon and his colleagues determined the effect on spirochetes of wide swings of temperature in 8 patients with dementia paralytica. The temperatures of the patients were first lowered and then raised as rapidly as possible with the fever cabinet and inductotherm. Thirty-seven such treatments were given. In reducing the temperature the authors followed the technic of Fay. The patient was prepared by a cleansing enema on the evening before, and without breakfast was placed in the fever cabinet with the cover open. After ten or fifteen minutes for stabilization of the temperature (read by means of a constantly recording rectal thermometer), from 7 to 10 grains (0.45 to 0.65 Gm.) of sodium ethyl (1 methylbutyl) thiobarbiturate administered produced a satisfactory anesthesia. Approximately 100 pounds (45 Kg.) of finely cracked or shaved ice was placed about the patient from the axillas to below the knees, excluding the back. One arm was kept exposed for blood pressure readings and subsequent venipunctures. From time to time the anesthetic agent was injected in decreasing doses to maintain anesthesia. When the temperature fell to approximately 90 F. the ice was removed, the body dried and wrapped in warm blankets and the cabinet cover lowered and the heat turned on. After the patient's temperature began to rise, the inductotherm was turned on and temperature of the cabinet was maintained between 102 and 105 F. until the patient's rectal temperature was between 104 and 105 F. The cabinet was then opened and the body temperature allowed to return to normal. The swing in temperature was readily effected and caused no noteworthy disturbance. A few hours after the treatment the patient was able to be up and about and apparently had no delayed symptoms or discomfort. The temperature may be dropped, raised and brought back to an approximately normal level in about six hours. There appeared to be definite relationship (as yet unknown) between the depth of anesthesia and the rate of temperature decline. Several factors probably play a part; the deeper the anesthesia, the lower the metabolism and therefore the less heat created. Also there probably is an increase in superficial vasodilatation with the result of greater cooling, and the anesthetic may not only produce generalized muscular relaxation but also may paralyze the heat-regulating mechanism in the hypothalamus. When the ice is removed from the patients requiring a third dose of the anesthetic, a sudden precipitous fall of from 1 to 3 degrees F. was observed. The phenomenon is not clear and may be related to the depth of anesthesia. After the

ice is removed and an attempt is made to raise the temperature, shivering makes its appearance as the temperature rises. In some cases it became violent, but became modified or disappeared when the temperature reached approximately 94 or 96 F. Patients have no unpleasant recollection and none objected to a second treatment. The amnesia is apparently due to the anesthetic and not to the lowered temperature alone. The anesthetic during the low body temperature not only dulls the cerebral centers but also lessens the discomfort of the raised temperature. This factor cannot be measured but has been observed in every case. The authors point out that the efficacy of the method in comparison with ordinary artificial therapy cannot be stated before a large group of patients have been similarly treated. — (Abst. J. A. M. A. **116**:1872 [April 19] 1941.).

Literary Clubs for Patients: A New Approach in Mental Hospitals. Nathan Blackman.

Mod. Hosp. **55**:60 (Dec.) 1940.

Under present economic conditions the question arises as to how mental patients can be rehabilitated without too great an expenditure of money. In this connection a literary activity conducted by the patients in a closed ward at Worcester State Hospital, Worcester, Mass., may be of interest.

For the past year a group of 20 or 30 patients has been meeting regularly for the purpose of editing a monthly publication. Meetings are held weekly. The members elect the editors and discuss the articles submitted for publication. It was decided to sell the *Current* at 5 cents a copy and the club has successfully disposed of about five hundred mimeographed copies per month. The paper consists of from twelve to fifteen pages of text with colored covers, artistically decorated by one of the patients, who serves as the art editor.

Members who have parole privileges are permitted to sell the *Current* to both visitors and employes, who become constant readers. Only contributions by patients are accepted, and usually only minor editing is necessary.

Hypotension. H. J. Starling.

Practitioner **146**:77 (Feb.) 1941.

Friedlander sums up the views of various authors by stating that the factors which maintain the blood pressure at normal levels are (1) force of cardiac contraction, (2) condition of vessel walls, (3) peripheral resistance to the blood stream as determined by the vasomotor system, and (4) the blood volume, the physical state of the blood itself and its viscosity.

He considers the third factor the most important and quotes the work of Dale, Laidlaw and Krogh, who have shown that the capillaries constitute an actively contractile part of the vascular system, having an intrinsic tone which can be modified by nervous or chemical influences.

For the immediate relief of fainting and collapse, an injection of atrophine sulfate 1/50 grain, is of value, but its action is transient. In cases in which the attacks are repeated and prolonged I have found epinephrine, 1:1,000, 4 minims, hypodermically administered, to be the best stimulant. Ephedrine ½ grain may be given by the mouth three times daily.

Massage to the abdomen and limbs, followed by passive and then active exercises, should be begun as early as possible. Before the patient sits up or gets out of bed a tight abdominal binder should be applied. A remarkable improvement, amounting in many cases to what may be termed a cure, is effected by the wearing of a firm abdominal support. The type I have used consists of a metal shield which covers the lower half of the abdomen, pressure on which is obtained by lateral steel springs ending in pads, which rest on either side of the lumbar spine and are brought together at the back by a strap. Such a support brings the level of a proptosed stomach a good deal higher, but it must also raise the intra-abdominal pressure and prevent an undue accumulation of blood in the splanchnic plexus. Some women object to this type of belt, for which may be substituted a good make of sports corset, the upper level of which does not reach higher than the umbilicus.

Minimum Standards for Convalescent Hospitals. E. H. L. Corwin.

Hospitals **14**:23 (Dec.) 1940.

A convalescent institution is not a vacation home or a custodial home or a hospital for chronic diseases. It is a medical institution designed for patients recovering from acute illnesses, operations or exacerbations of illnesses which may be chronic.

At present there are practically no facilities for post-hospital care of patients who have had operations for brain tumor and for whom a certain amount of improvement is to be expected. Several neurologic conditions which were considered hopeless a few years ago are now said to be benefited or cured if given proper care over extended periods. Among these are deficiency states, such as subacute combined sclerosis, pellagra and some forms of muscular atrophy. Convalescent institutions for neurologic patients should be somewhat more elaborate with regard to equipment and personnel than is necessary in general homes. Equipment for hydrotherapy and other types of physical therapy should be provided, and a great deal of emphasis should be laid on recreational and occupational therapy as well as on the selection of the proper type of physical and occupational therapy technicians.

In orthopedic cases the concept of convalescence should extend beyond the patient's stay in a convalescent home. A physical handicap may make it necessary for the patient to find a new outlet for his economic usefulness. A complete orthopedic convalescent program should therefore include training to fit the patient into a new

occupational pattern. Vocational training is hardly possible in a convalescent institution unless it is of a specialized type.

A Hospital Study of Poliomyelitis With a Follow-Up Survey One Year Later. Leo Litter.

Arch. Pediat. **58**:413 (July) 1941.

At the Kingston Avenue Hospital the orthopedic treatment is instituted as soon as the acute illness has subsided, and the temperature is normal. The proper therapy is the utilization of rest, orthopedic appliances, physical therapy including graded exercises, and surgical procedures. The treatment should begin at the earliest sign of paralysis, demonstrated at first by any definite weakening in muscle strength, and not necessarily by a total or even extreme loss of power. The paralysis, which occurs, is of the flaccid type, the part affected being limp and lifeless.

When any signs of muscular weakness, paralysis or contractures exist and when the acute illness has subsided, and further spinal punctures are unlikely, a plaster of Paris cast is applied to the involved part in the normal or in the overcorrected physiologic position.

The second or convalescent stage extends from the subsidence of muscle tenderness to the slowing of the process of recovery of muscle power. The duration of this stage may be at least two years. The third stage, the stage of residual paralysis, represents the best end result so far as muscle strength is concerned, the remainder of the patient's life.

In the treatment during the acute stage and also during the convalescent stage one must consider three definite points: 1. Maintenance of nutrition and circulation to the involved part. 2. Restoration of muscle power. 3. Prevention of deformities. In the early stage, during the period of immobilization, the following is accomplished: pain is relieved, the involved part is kept at rest, contractures and deformities are prevented and proper circulation of the part is maintained. Further, bivalving the cast favors the maintenance of nutrition by means of radiant light and heat, permits light massage, and prevents disturbances of circulation. Direct application of heat to the cold extremities, such as warm tub baths, facilitates movements of the various affected parts within the limits of pain. The daily warm bath tends to shorten the phase of muscle tenderness and aids in the prevention of contractures. Exercise should be started slowly and with great care. Any sign of fatigue, whether local or general, should be avoided.

The Larynx in the Tuberculous Patient. Robert M. Lukens.

Arch. Otolaryng. **34**:110 (July) 1941.

Laryngologic treatment of a tuberculous patient comprises treatment not only of a tuberculous lesion of the larynx but also of all existing diseases of the nose and throat. Examination of the nose, throat and larynx when pulmonary tuberculous is first diagnosed usually provides time to do necessary operations on the nose and throat before operations are contraindicated by advanced pulmonary lesions.

During this period diseased tonsils may be removed with the region under local anesthesia, although some authorities believe that operation on the tonsils is contraindicated in any patient who has the last pulmonary activity.

Patients under treatment with artificial pneumothorax seemed to do well. By lessening cough and expectoration, artificial pneumothorax relieved the larynx of irritation and contamination by the pulmonary secretions.

Electrocautery is the accepted means of local treatment for laryngeal tuberculosis. Although one of the most effective means available, yet the author feels it is a mistake to advise its use in all cases of laryngeal tuberculosis. It is comparatively easy for a laryngologist experienced in the treatment of laryngeal lesions to apply the cautery, but a novice who has had little experience in the treatment of tuberculosis can do a great deal of harm with the apparatus.

Vocal rest is the one treatment that is indispensable and should be complete.

Vitamin A and Other Fluorescent Substances in the Retina. R. Greenberg, and Hans Popper.

Am. J. Physiol. **133**:301 (June 1) 1941.

Thin frozen sections of the ablino rat eye were mounted wet and examined in ultraviolet light for vitamin A content (bright green fluorescence which fades within one-half minute of irradiation) according to the method of Querner (Klin. Wchnschr. **2**:1213, 1935) and of Popper (Proc. Soc. Exper. Biol. & Med. **43**:133, 1940).

The preliminary report of von Jancsó and von Jancsó (Biochem. Ztschr. **287**:289, 1936) showed that vitamin A is present in the light adapted retina, and absent from the dark adapted retina, consistent with Wald's formulation of the visual cycle.

Greenberg and Popper have confirmed and extended these results. Vitamin A is distributed in the eye in two ways: 1, in the ciliary processes, its presence depends on the nutritional status, and is independent of the state of light adaptation; and 2, in the pigment epithelium and in the rod and cone layer the presence of vitamin A does not depend on the nutritional state, but on the state of light adaptation. Within the limits of the method there may be some reduction in amount in vitamin A deficiency.

In the ciliary processes the vitamin A is present in droplets in the capillary endothelial cells and in the fixed connective tissue cells. In the pigment epithelium the vitamin A is present in small droplets and in thin filaments connecting the droplets, arranged at the corners of the hexagonally shaped cell. The pigment epithelium contains most vitamin A; the rod and cone layer only traces.

In addition the eye showed two types of fluorescence, not due to vitamin A, which varied with the state of light adaptation: 1, in the dark adapted eye a homogeneous, rust-colored, non-fading, background fluorescence is seen in the pigment epithe-

lium, the rod and cone layer, and the outer molecular layer; 2, in the light adapted eye, this is replaced by a yellow, homogeneous, non-fading, fluorescence. The basis of this change is not yet known.

Discussion on Injuries to Peripheral Nerves. Rowley Bristow.

Proc. Roy. Soc. Med. **34**:513 (June) 1941.

Pre- and postoperative treatment is on similar lines and is considered under two headings, postural, and nutritional.

The author considers one or two points under these headings.

In the adult relaxation of paralyzed muscles even in the zero position the metacarpophalangeal joints and the interphalangeal joints will get very stiff if kept fixed. For these joints the author advises a compromise, which is best effected by the use of the short cock-up and the musculospiral glove, this latter consisting of elastic accumulators replacing the paralyzed extensor tendons of the thumb and fingers.

Nutrition is maintained and improved by the application of heat, the use of massage, electrical stimulation, exercises and reeducation. By electrical stimulation is meant interrupted galvanism to the paralyzed muscle, which exhibits the reaction of degeneration. The author has no strong views as to the value of electrical treatment physically, although psychically it is of great value. For a patient to see a muscle which he cannot activate voluntarily, contract and relax, and a joint which to him is dead and useless, moved by his own muscle, must be an encouragement. Those who feel this form of treatment to be ill advised will point out that denervation of muscle is followed after a few days by the onset of spontaneous, rhythmic contractions, fibrillation, which usher in rapid and progressive atrophy, and that to add still further to the work this degenerating muscle is forced to do is harmful.

Depressive States in the Soldier. R. F. Tredgold.

Brit. M. J. **4203**:109 (July 26) 1941.

For depressive states in the soldier the author recommends rest, general psychotherapy and prolonged narcosis. The patients were kept in bed for at least twenty-four hours, practically all for forty-eight hours, and some for a week. During this time the question of future treatment and of narcosis therapy was considered. The majority of the patients, however, were those whose progress appeared satisfactory; they were gotten up and given light jobs, usually in the ward, requiring little concentration, responsibility, or perseverance. Their existence was ruled by a fairly strict routine time table; it included regularly fresh air and adequate meals. Gradually their occupation was made more interesting and more vigorous, and so far as possible in tune with their own hobbies or occupations. This was not always feasible, and rug and basket making, digging, and weaving proved valuable substitutes, with the help of varied physical training and entertainment such as cinemas and organized games.

General psychotherapy consisted in giving individual encouragement and reassurance, and later included a series of talks, leading the patient to adjust his personality to cope with his difficulties so far as was possible and stressing the fact that he had passed through an illness caused, like any other, by physical factors.

Those patients whose progress appeared unsatisfactory after a few days' observation or who suffered acute anxiety were recommended prolonged narcosis.

Sensitivity of the Skin to Fluorescent Light. Arthur P. R. James.

Arch. Dermat. & Syph. **44**:256 (Aug.) 1941.

A new type of illumination produced by daylight fluorescent mazda lamps is coming in use, particularly in industry. In the development of a new source of light for general purposes, engineers are concerned with confining the radiant energy emitted by the lamp within the wavelength range of natural sunlight. The glass tubing of the fluorescent lamp has a composition which absorbs all the energy of the shorter wavelengths than the short wave limit of sunlight. Nevertheless, dermatologists must be alert to the possibility of sensitivity to this type of lighting. I am reporting 2 cases to illustrate this fact.

Since this type of lighting is so desirable from a general standpoint, it is rapidly becoming popular, and undoubtedly many cases of sensitivity will be encountered. The fact that the wavelengths of the radiant energy of this type of lighting are confined to the range of natural sunlight would influence the belief that a person who would tolerate sunlight would tolerate this light. Case 1 disproves this belief. A person may show sensitivity to an isolated band of light yet tolerate it when it is mixed with light of other wavelengths.

With this fact in mind a new tube has been produced, termed "soft white," which will give off added red rays. It is hoped that the addition of the red rays will neutralize the effect of the rays producing dermatitis. Progress in this regard will be reported in a later paper. In the meantime temporary protection may be afforded the sensitized person by the use of a tannic acid solution and the wearing of polaroid glasses at the time of exposure.

Electro-Diagnosis and Electrotherapy in Peripheral Nerve Lesions. P. Bauwens.

Proc. Roy. Soc. Med. **34**:459 (June) 1941.

The author discussed five methods of exploring the extent of damage to the nerve.

The classical method is the method in which nerve trunks, motor points, and the muscle itself are stimulated in turn by faradic and galvanic currents. Simplicity of apparatus and of technic recommend it. Unfortunately the faradic current cannot be measured. The galvanic current can be measured but the values are of little significance.

Of greater value are the qualitative features of the responses obtained. It must be remembered that this response may be the resultant of two contractions when the muscle tested consists of mixed fibres, normal and denervated. The former will account for the brisk component at make, the latter for the sluggish contraction which gives the impression of slow relaxation. Naturally the ratio of the two types of fibres will determine the overall response. Where pain makes it impossible to use currents of sufficiently high intensity to be conclusive, an anaesthetic is used.

Chronaximetry is exact only when all nerve fibres undergo degeneration or regeneration at the same rate and where homogeneity exists. It fails to reveal the presence of normal fibres. This is particularly the case when rectangular wave impulses are used although it may do so when exponential condenser discharges are used.

The Cluzet method, which was also adopted by Lewis Jones, is almost certain to detect normal fibres, since condensers are charged to a definite potential and are always started with strong impulses of short duration. The shape of the stimulating current curve is dependent on unpredictable factors such as skin resistance, edema, etc. There is the possibility of stimulating various fibres simultaneously with exponential stimuli.

The fourth method discussed plotting an intensity duration curve, employing rectangular waves. This technic is tedious and nearly as much information is gained from a curve plotted from three points representing three different durations, the base line being reduced to unity.

The fifth method discussed by the author is by means of modulated currents. To stimulate a nerve the onset of the current must have a steeper gradient than to stimulate muscle, particularly denervated muscle, and the ratio of the current required to stimulate a muscle with rectangular waves to that required to stimulate it with a progressive current bears a relation to the state of the muscle and nerve.

Each method has its advantages under certain circumstances. The faradic current will reveal the presence of normal muscle fibre except when considerable edema is present, while the progressive currents will pick out denervated fibres. Chronaximetry, by detecting early return towards shortened chronaxies may point to concussion of the nerve as opposed to more severe damage. Galvanic stimulation of the nerve trunk may indicate recovery before voluntary control has returned.

With regard to the value of artificially produced muscle exercise in paralysis, on the assumption that function improves the organ, the author believes in electrical stimulation of paralyzed muscles, for although it does not prevent atrophy, circulation and nutrition are improved. To be effective and non-injurious it is important to use a technic which will not produce contractions in normal muscles surrounding and opposing the paralyzed ones. Fatigue must be avoided by allowing long pauses of rest between contractions which should be few in number. If the blood supply is inadequate this treatment may have to be withheld.

Where interrupted galvanic currents produce contraction of antagonistic muscle groups, the progressive currents or modulated direct current should be used.

Gonorrheal Ophthalmia and Gonorrheal Ophthalmia Neonatorum. An Evaluation of the Treatment. Everett Barclay Muir.

Am. J. Ophthal. **24**:879 (Aug.) 1941.

Gonorrheal disease of the eye continues to exact a toll of damaged and lost eyes in spite of more efficient prevention and improved treatment.

Irrigation of the conjunctival sac is considered to be indispensable by all clinicians. Iced compresses are frequently used for swelling of the lid while hot compresses are used occasionally for the same purpose.

Intermittent iced compresses were found of benefit, while the use of continuous iced compresses increased the frequency of corneal ulcers.

Corneal ulcers occurred much less frequently in gonorrheal ophthalmia if the palpebral conjunctiva was painted by a physician with silver nitrate 0.5- to 2-per cent solution, than if the same solution was instilled.

Progress in the treatment of gonorrheal disease of the eye may be said to have made three considerable advances in the last decade. In the order of their introduction, credit for these advances must be given to: 1. Nonspecific or foreign protein therapy. 2. Artificial fever therapy. 3. Sulfanilamide therapy. The second is closely allied to the first in its rationale. The third achieves its results in an entirely different manner and is a form of chemotherapy. In none is the mode of action entirely understood, and their use is fundamentally empiric. All three have reduced the length of hospitalization; all have diminished the frequency and severity of corneal complications.

While the use of sulfanilamide compounds has produced more brilliant results than any previous therapeutic measure, they must be used with caution, and with a full understanding of the potential dangers. There will continue to be cases of gonorrheal conjunctivitis, resistant to sulfanilamide compounds, in which recourse to all available therapeutic resources will be necessary to prevent loss of the eyes.

Music—An Aid in Management of the Psychotic Patient. Preliminary Report. Ira M. Altshuler, and Bessey H. Shebesta.

J. Nerv. & Ment. Dis. **94**:179 (Aug.) 1941.

The author in his summary, states that music seems a useful agent in decreasing the output of disturbed and inaccessible mental patients, both alone and in conjunction with various forms of hydrotherapy. The use of music with hydriatic procedures tends to prevent the development of a feeling that such treatment is a punitive measure. Music appears more practical than hydro-

therapy because larger groups of patients can be treated simultaneously. Music, particularly familiar tunes, bringing back memories and realities, is a natural substitute for states of phantasy, fear and excitement. Further observations on the controlled use of music are desirable.

Electric Shock Therapy. H. Cerletti.

Wien. med. Wchnschr. **90**:1006 (Dec. 28) 1940.

Cerletti reviews the status of the electric shock therapy of mental disorders. Experiments with different species of animals (dogs, cats, hogs) induced him to try the procedure on human subjects. He learned that it is much less dangerous to pass the electric current through the brain than through the trunk, because in the latter passage the heart is affected. The author's aim was to find a substitute for the metrazol shock therapy of schizophrenia. Convulsions are elicited with a current voltage of from 70 to 110 (300 to 600 milliamperes). The majority of investigators agree that this voltage is best, but some have employed voltages up to 150. The author passes the current for one-tenth of a second, though some investigators pass it for longer periods. In cases of melancholia and manic depressive psychosis complete recovery has been obtained by from four to six applications. The treatment must not be terminated too early. At the author's clinic the electric shock treatment is usually applied two or three times a week; in other clinics it is given more frequently. Comparisons with the insulin shock therapy revealed that the electric shock therapy is preferable in all mental disturbances accompanied by depression, especially in those patients with psychomotor inhibition or retardation. The author employs it in the majority of patients with schizophrenia. Insulin shock is preferable in patients who are in a state of psychomotor excitation and who are emaciated. In schizophrenia and in manic depressive psychosis recurrences are likely and treatment should be repeated as soon as signs of relapse appear. Braunmuhl suggested that in mental disorders of a periodic nature the electric shock therapy be repeated from time to time in order to prevent recurrences. — (Abst. J. A. M. A. **117** [Aug. 9] 1941.)

Phantom Limb. Allan A. Bailey and Frederick P. Moersch.

Canad. M. A. J. **45**:37 (July) 1941.

"Phantom limb" is a term used to designate the sensation of feeling the presence of an extremity following its amputation. Phantom syndromes also may occur following the amputation of a breast or penis, or following the extraction of a tooth. Phantom limb is of more than casual interest, since the associated pain and dysthesia may incapacitate the patient and in some instances lead to drug addiction or suicide.

It is said that when many types of treatment are recommended for a disease no one of them is entirely satisfactory. The literature contains numerous reports of the successful treatment of phantom limb and pain in the stump, but in most cases the duration of the cure has been recorded in months rather than in years.

Application of physical therapy to the stump relieved the symptoms for a short time in some cases but in others it did not produce any relief. In one instance it proved satisfactory when used every three or four months.

Each of 15 patients was subjected to one operation and each of 25 patients was subjected to two or more operations; 15 were not treated surgically. The treatment of this syndrome is still unsatisfactory.

Rowing Method of Artificial Respiration. M. C. Rosekrans.

Wisconsin M. J. **40**:567 (July) 1941.

With the patient supine, place yourself at the patient's head. Grasp the patient's arms at the wrists and firmly extend his arms above his head, to raise the chest, keeping them there long enough for air to enter the chest; then rapidly drop the arms back toward the patient's chest, leaving them there long enough for air to rush out of the chest. Repeat this rowing motion ten to twelve times per minute.

The rowing method depends for its success on the fact that the arms are extended over the head and the accessory muscles of respiration are brought into play; they are the pectoralis major and minor, and subclavius muscles. The arms act as levers of the second class, the weight of the chest being lifted and suspended through the above named muscles. There is no pressure brought to bear on the body at any point. With the patient in a comatose state, the chest is raised with little effort. As stated by the author, one operator is to carry on the rowing motion for two hours or more with ease. The operator may take time out to change position and to pause for a few seconds from his work.

The rowing technic of artificial respiration has definite advantages over the prone pressure method as follows:

1. It requires only one operator.

2. Since there is no pressure applied, and the extension of the arms is within normal limits, there is no chance for trauma.

3. It adapts itself to use under any condition when artificial respiration is necessary.

4. It also adapts itself to the convenient observation and care of the patient.

5. The procedure is that of an entirely positive respiratory mechanism throughout, and admits a maximum amount of aeration.

6. Mechanically the rowing technic is satisfactory.

a. The mechanism depends on the expansion of the respiratory cage through the pull of the accessory muscles.

b. The lungs are expanded in a positive phase.

c. The weight of the anterior chest returning to rest causes the expiratory phase.

d. Accessory muscular tone remains satisfactory so long as there is tone in other muscles.

e. The respiratory rate is lower because of greater aeration.

Early Orthopedic Care in Poliomyelitis. C. E. Irwin.

J. A. M. A. **117**:280 (July 26) 1941.

The orthopedic care during the acute phase is concerned with (1) the preservation of all the potential muscle power that has been spared by the acute infectious process and (2) maintenance of the skeleton in proper alignment while these potential neuromuscular units are being protected.

When the patient is making no further improvement—when there is nothing more to salvage—the condition passes into the chronic state.

Irwin feels that exercises following this period of prolonged rest are best provided in a medium of warm water. Hydrotherapy is often continued three or four months before weight bearing is started. He feels that further improvement in muscle power from hydrotherapy is due to hypertrophy of muscle tissue that remains.

Coordination of Therapy in Arthritis. Ralph Pemberton.

Pennsylvania M. J. **44**:1306 (July) 1941.

The author states that Dr. Mitchell knew nothing of focal infection but his results were magnificent and carried his name around the world because he understood the importance of the basic principles of physiology. These basic principles are just as significant today as they ever were. In discussing the value of rest the author further relates: (1) Rest in recumbency improves the circulatory dynamics; it is especially important in the capillary beds. (2) Rest dilates constricted peripheral vessels because of added warmth referable to the bed clothes. (3) Rest modifies undue gravitational "pull" on ptosed and other organs. (4) Rest facilitates the passage of fluids from tissues into vessels. (5) Rest lessens overaction of nervous system by reducing psychic and physical stimuli (from activities and pain). (6) Rest permits replacement of the deficits and removal of the excesses which constitute fatigue. (7) Rest reduces energy losses and caloric demands. (8) Rest "splints" traumatized joints and muscles and permits repair. Physical therapy may be of extraordinary value and in some instances may be essential to recovery. The bases of physical therapy are heat, massage, rest, and exercise. Properly used these measures may not only improve circulatory conditions locally, modify pain, and restore tone to atrophied muscles, but they may even contribute to an increase in the red cell count. Physical therapy, which should include also postural exercises, will conduce toward reduction and especially prevention of deformity. Unfortunately, many technicians practicing physical therapy are animated by an undue zeal, springing, not unnaturally, from personal knowledge of the benefits which physical therapy can achieve. Unless technicians are advised that the treatment of arthritis differs from that of most other conditions, in that it must be conducted gently or not at all, they may add insult to injury by further traumatizing the joint tissues. The crime of "freezing adhesions" and churning joints is commoner than supposed. It may be said by way of epigram that treatment of arthritic joints by means of physical therapy should be directed anywhere except to the joints.

Pemberton gives the following order of prescription for the sick arthritic patient: 1. Rest. 2. Sedation and/or stimulation. 3. Optimal nutrition in the refined sense. 4. Proper gastrointestinal function. 5. Time for establishment of a general equilibrium. 6. Examination for foci of infection. 7. Medication, such as iron, arsenic, nux vomica, etc. 8. Treatment of foci, conservatively. 9. Use of physical therapy, conservatively. 10. Orthopedic help. 11. Last, if at all, vaccines, gold, etc. 12. Psychic reeducation.

Periarthritis of the Shoulder — Solomon, et al.

(Continued from page 684)

routine care of such conditions about the shoulder includes the application of diathermy followed by massage and the judicious use of active and passive exercises.

In acute conditions the use of the diathermy has often been condemned. Early in our experience we found that excessive pain occasionally followed the use of too much heat and learned that the technic as mentioned overcame this difficulty.